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THESIS

**CORPORATE CONSOLIDATION:
AN EVENT STUDY OF HISTORIC STOCK PRICES
IN THE DEFENSE AEROSPACE INDUSTRY**

by

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December 2009

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IN THE DEFENSE AEROSPACE INDUSTRY**

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ABSTRACT

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I. INTRODUCTION

A. CHAPTER OVERVIEW

Chapter I provides a general overview of the structure and purpose of this project by providing a brief background, the problem statement, study purpose, research questions, methodology, and project limitations. In doing so, this chapter will generate insight regarding the significance and subsequent analysis of the identified problem.

B. BACKGROUND

The past two decades have witnessed significant changes in the global defense industry. These changes include declining government defense spending levels, changing corporate defense-sector structures and a restructuring of the way in which business is conducted within the industry. During the seven-year period between 1987 and 1994, global defense spending levels declined by more than 35%. With dissipating tension between Eastern Europe and the Western World as a result of the Cold War's end, similar declining budgetary trends are seen in the United States and Europe, particularly in Germany and the United Kingdom (Dowdy, 1997, p. 88). These budgetary cutbacks have impacted defense contractors industry-wide, thus resulting in significant changes for all defense-industry sectors, ranging from defense electronics to fighter aircraft (p. 90).

Since 1990, there have been significant declines in prime contractors in over 80% of the sectors DoD identifies as important to national security. For example, the number of contractors providing tactical missiles has declined from 13 in 1990 to just 4 as of 1998 (GAO, 1998, p.2). Appendix A identifies the defense contractors participating in 10 major defense sectors in 1990 and 1998. The table indicates the structural changes that occurred within the defense industry.

Although global and U.S. defense industry trends are of interest, they exceed the scope of this project. Rather, the interest of this project is in the reactions and strategic realignments of U.S. defense-aerospace contractors as a result of the waning financial

interest of the U.S. Government in defense-related spending. With the declining power of the Communist Warsaw Pact leaders and the Soviet alliance on the brink of collapse, Mikhail Gorbachev and President George H.W. Bush declared the Cold War officially over in December 1989 at a summit meeting in Malta. Since the abrupt end of the Cold War and the rapid decline of Communist influence in the early 1990s, the Department of Defense (DoD) and the defense industry have both endured dramatic change.

For instance, in 1992, the defense-aerospace industry was characterized by 26 major firms. As a result of industry consolidations, within less than 10 years, this same industry this industry only had four major firms. Figure 1 provides a visual representation of the consolidations within the defense-aerospace industry. The four surviving firms in the defense-aerospace industry—Boeing, Lockheed Martin, Northrop Grumman and Raytheon—are the focus of this analysis.

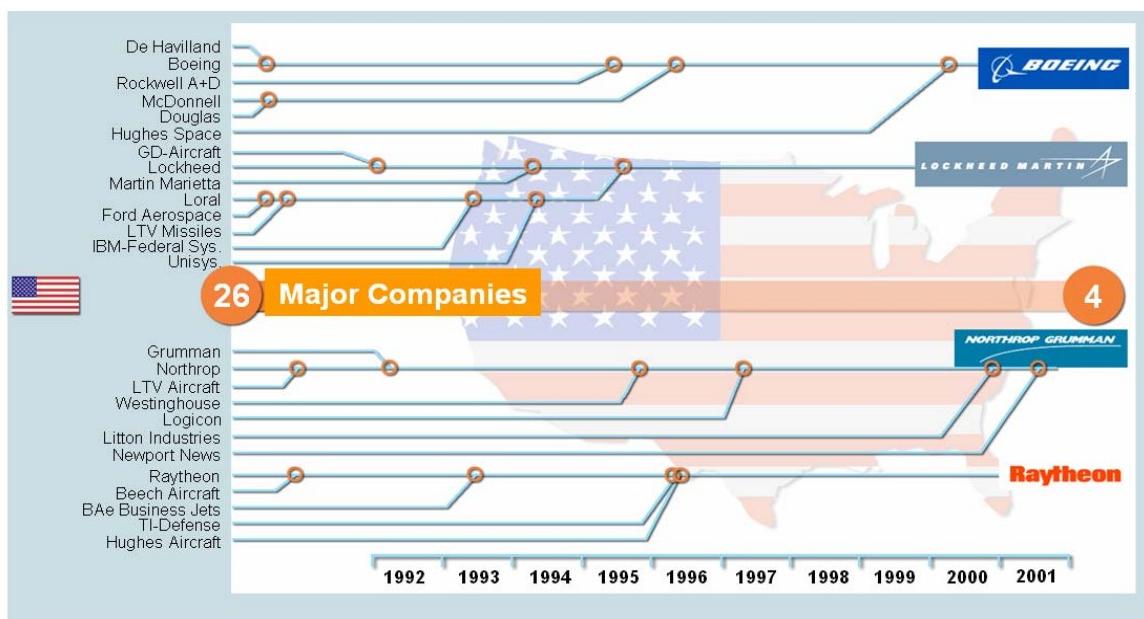


Figure 1. U.S. Aerospace Industry Consolidation (From: Vincent, 2007)

C. PURPOSE OF STUDY

The purpose of this study is to determine if the stock market is efficient with respect to corporate consolidation announcements within the defense-aerospace industry. It attempts to do this by analyzing stock returns over the 40-day period following the

announcement. Specifically, the analysis attempts to determine how quickly and accurately the market absorbs the information provided by a corporate consolidation announcement, a perspective largely lacking in the existing literature. As will be discussed further in the literature review, the work of Grant (2007) provides a more generalized analysis of five defense sector firms providing regression results for the announce date and the day immediately following the corporate action listing. Grant's research begins to explore how quickly information is absorbed by the market. This research provides additional insight by considering how accurately that information was absorbed by expanding the analysis from the 1st day following the announcement to also include the 10th, 20th and 40th day following the event. In doing so, this project adds to the body of knowledge by providing a unique, focused analysis to determine if there are any trends that may be present across the focus firms.

D. METHODOLOGY

This project involves a series of event studies reviewing the daily stock price returns of defense-aerospace contractors involved in corporate consolidations. A methodology using an Ordinary Least Squares (OLS) analysis is utilized to study historic stock price returns of defense-aerospace contractors and whether stock price behavior following consolidation announcements is abnormal or not. By estimating expected stock price returns as a function of the generalized market return (using historic prices prior to the announcement date of a corporate action to provide the OLS estimate), and then comparing the expected return to the actual return on the 1st, 10th, 20th and 40th day following the consolidation announcement, the analysis was able to identify instances in which the focus firms' stock prices yielded abnormal returns. This analysis provides insight into the market's immediate and subsequent reaction to the release of the information.

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II. LITERATURE REVIEW

A. CHAPTER OVERVIEW

Chapter II provides a literature review and existing empirical findings of event studies involving corporate consolidations, which helped in the development of the methodology applied in this analysis.

B. APPLICATION OF EVENT STUDIES IN THE ANALYSIS OF CORPORATE CONSOLIDATIONS

Although the literature involving event studies of historic daily stock prices for U.S. defense contractors is limited, the literature does extensively review event studies on more generalized markets. Weston (1983) provides a generalized review of mergers to generate some broad observations. Weston's literature review validated that mergers generally produce positive returns for the firms involved—positive returns that are sustained over time. Furthermore, his findings do not empirically support the managerialism theory that mergers are conducted to increase managers' compensation (1983, p.343). Weston also identifies concerns that abnormal returns are not stated correctly. More specifically, he asserts that acquiring firms generally experience positive abnormal returns prior to the period in which the acquisition occurred, while acquired firms generally experienced the opposite in earlier periods, thus resulting in an understatement of the gains to the acquiring firm and an overstatement of the gains to the acquired firm at the time of the acquisition (p.344). The last point of interest from Weston's work is that merger activity generally follows trends within sectors: thus occurring in distinct waves.

Building on this research, Lubatkin (1987) reviewed a sample of over 1000 merged firms to answer the two following questions:

1. Do mergers induce permanent improvements in the stockholders' wealth position in acquiring and acquired firms?

2. Do the observations from the strategic management literature generalize to the acquisition market; i.e., are investors' expectations higher for mergers that involve some unifying features than for mergers involving unrelated firms? (Lubatkin, 1987, p.39)

Modifying the Federal Trade Commission's (FTC's) approach of classifying mergers according to merger type, Lubatkin hypothesized that the appreciation in stockholder value, from highest to lowest, would result from horizontal mergers, conglomerate mergers and, lastly, vertical mergers. Modeling the monthly rate of return for stockholder value as a function of the monthly rate of return for the market portfolio, the risk-free rate of return (the yield on treasury T-bills with 1 month to maturity), a stochastic error term and estimated firm-specific parameters, Lubatkin reviewed the available data for abnormal returns. The firm-specific parameters were estimated using 60 months of data prior to the merger, beginning 67 months before the transaction month; this model was then applied to estimate monthly returns for 60 post-merger months, beginning 5 months after the merger. It is important to note that Lubatkin discusses his use of monthly stock price returns as opposed to the more common daily stock price returns over a shorter time horizon. Although the author comments that daily returns should provide a more accurate portrayal of the market's reaction to the observed corporate action, there is concern that the market may under-value the event if there are multiple corporate actions occurring near the specified time with no clear method for estimating the event's full market valuation (1987, p.43).

Lubatkin's findings indicate that, in general, mergers create permanent gains in common stock valuations for both the acquiring and acquired firms. However, as per Lubatkin's initial hypothesis, there was no clear link between the merger classification and the extent of these gains. The author provides a number of explanations for this surprising result—including that it may be difficult for the investor to gauge the market relatedness¹ of a merger, that the metric for identifying market relatedness may be overly arbitrary, or that the long-term success of the merger also plays a role in sustained value creation, a factor not explicitly controlled in the model.

¹ A measure applied in the study to identify the extent to which the product markets of the merging firms overlaps.

The work of Akhigbe, Aigbe, Borde and Whyte (2000) focuses on estimating the stock valuation gains of the acquired, or target, firm in a corporate consolidation. According to their literature review, “shareholders of target firms earn significant positive abnormal returns, but the shareholders of acquiring firms earn normal returns” (Akhigbe et al., p.101). Akhigbe et al.’s (2000) methodology includes reviewing 192 terminated mergers, occurring between 1987 and 1996, in which abnormal returns are calculated as the difference between actual daily returns and the predicted daily return (the return experienced by the “value line” industry matched to the firm).

In summary, their work supports the initial hypothesis, suggesting that acquired firms are expected to show significant gains catalyzed by the merger announcement. Interestingly, their work also indicates that rivals of the acquired firms also experience gains after the merger announcement (Akhigbe et al., 2000, p.110). Upon termination, the gains to the rivals are persistent; however, the gains to the target decline to a negative rate, below that of the original pre-announcement date level. The explanation provided for this phenomenon is that the merger announcement, although not completed, may serve as a signaling device for future mergers within the sector, of which the competitors are potential targets (Akhigbe et al., 2000, p.102). In generalizing, the researchers attribute the gains to daily stock prices as a result of a signaling effect within the sector.

The last research relevant to this project is that of Grant (2007), which provides a more generalized perspective of defense sector consolidations over the period of interest. Utilizing Bloomberg, the same data source applied in the analysis of this project, Grant identified 125 corporate consolidation announcements that involved the following five defense firms: Boeing, Lockheed Martin, General Dynamics, Raytheon, and Northrop Grumman (2007, p.2). The research analyzed instances of abnormal arithmetic and logarithmic stock returns over the event window² utilizing regression estimates based on an average of 120 days (approximately 6-months) of pre-event daily stock price data (Grant, 2007, p.14). The project did not provide any analysis of market response to the additional firms identified in the corporate actions listings. The results of Grant’s

² Within the research, the announcement date of the corporate action was defined as the event and the event window was defined as the event plus one trading day after the event.

research suggested that on average less than 50% of the events studied experienced statistically abnormal returns. Furthermore, with the exception of General Dynamics, when each focus firm was analyzed individually, each of the focus firms experienced a larger number of statistically significant negative abnormal returns than statistically significant positive abnormal returns (Grant, 2007, p.45). Because the overall results of the research were mixed and somewhat inconclusive, Grant suggests that although exact announcement dates were identified for the events, because the consolidations were frequently debated in political arenas, there was a general anticipation of the corporate actions before they were officially announced, which may have resulted in the ensuing inconclusive data.

III. OVERVIEW OF DEFENSE-INDUSTRY FOCUS FIRMS

A. CHAPTER OVERVIEW

This chapter provides a brief overview and history of the four defense-aerospace-industry focus firms presented in the analysis to follow. This introduction to each of the focus firms should illuminate the goals and objectives of each; and it will also identify significant similarities and differences between each of the four firms.

B. BOEING

Known as the world's largest commercial aircraft manufacturer, Boeing offers sales and services support to customers in more than 90 countries worldwide (*About us*, 2009a). The firm's primary Standard Industrial Classification (SIC) Code, 3721, classifies it as aircraft. However, secondary SIC Codes of 3663, 3761, 3764 and 3484 reflect the firm's involvement in: radio and television communications equipment, guided missiles and space vehicles, space propulsion units and parts, and ammunition (Boeing Company Details). Although the corporate headquarters is located in Chicago, the firm's more than 158,000 employees are dispersed across 70 countries. The firm also reports that over 57% of its labor force holds a college degree, with nearly 18% of those being advanced degrees in a multitude of business and technical fields (*About us*, 2009a).

1. History

Originally incorporated in the State of Washington in 1916, Boeing was later incorporated in Delaware in 1934. However, it was not until 1961 that the firm's present name was adopted. During its early history, Boeing focused on developing and producing commercial mail and passenger aircraft. By 1939, however, commercial aircraft production came to a halt and production efforts shifted to support the U.S. war effort. By June of 1941, Boeing was producing the B-17 and the B-24, two of the U.S. Army Air Forces' most important heavy bombers. In 1946, after the end of World War II brought several factory closures costing 70,000 jobs, Boeing continued to profit from

U.S. defense contracts. Commercial projects, such as a luxurious airliner known as the “Stratocruiser” built on the hull of the company’s four-engine C-97 troop transporter, did not flourish as the firm had anticipated. By the late 1950s, the firm maintained its defense aircraft contracts but also began exploring space rockets, various solid-fuel technology missiles and defense systems (*History*, 2007a).

2. Current Firm Overview

Today, Boeing’s mission statement is: “People working together as a global enterprise for aerospace leadership” (*Vision 2016*, 2007). Boeing is divided into six principal segments that are organized under two business units, Boeing Commercial Airplanes and Boeing Integrated Defense Systems. These business segments are as follows:

- Commercial Airplanes
- Aircraft and Weapon Systems
- Network Systems
- Support Systems and Launch and Orbital Systems
- Integrated Defense Systems
- Boeing Capital Corporation

Both of the Boeing business units are tied to the defense industry, with the Boeing Commercial Airplanes division providing aircraft contracts to both the private and government sectors. The integrated Defense Systems unit focuses on combining “weapons and aircraft capabilities, Intelligence and surveillance systems, communications architectures and extensive large scale integration expertise” (*Integrated Defense Systems*, 2007). The 2008 Boeing Annual Report indicates that the firm’s 2008 revenues totaled just under \$65 billion.

C. LOCKHEED MARTIN

Lockheed Martin Corporation is an advanced technology firm formed from the merger of Lockheed Corporation and Martin Marietta Corporation in March 1995 (*About us*, 2007b). The firm's primary SIC Code, 3761, indicates that its principal interest is guided missiles and space vehicles. The firm has five secondary SIC Codes, which include: 3764, space propulsion units and parts; 3812, search and navigation equipment; 3728, aircraft parts and equipment; 7371, computer programming services; and 7373, computer integrated systems design. These secondary SIC Code classifications reflect Lockheed Martin's five primary business segments, including Aeronautics, Electronic Systems, Space Systems, Integrated Systems and Solutions and Information and Technology Services (*Lockheed Martin Business Description*, 2007). Headquartered in Bethesda, Maryland, Lockheed Martin employs 146,000 people in 50 countries worldwide (*About us*, 2009b).

1. History

Although Lockheed Martin, as it stands today, is a relatively new firm, the roots of Lockheed and Martin Marietta can be traced to the turn of the last century. The Martin Corporation was established in 1909, and later merged to form Martin Marietta in 1961, becoming a major airframe supplier to U.S. military and commercial customers (*History*, 2007b). Lockheed Corporation's roots can be traced to 1913 when the founders, Allan and Malcolm Loughead flew the first Lockheed plane across the San Francisco Bay. The Lockheed Corporation was formally incorporated in June, 1932 (*Lockheed Martin history*, 2007). Unlike Boeing, which focused on commercial airlines prior to World War II, both Martin and Lockheed were involved with military aircraft production by the early 1930s. During World War II, Lockheed Martin's predecessors produced fighter and transport planes. The end of World War II caused Martin to shift its focus towards commercial aircraft, while Lockheed emphasized the defense industry. The start of the Cold War shifted the firms' focus once again, with Martin emphasizing weapon systems

and Lockheed supporting mobilization efforts for the Korean War and a Missile Systems Division. Both firms were also heavily involved in the NASA space programs in the 1960s (2007).

2. Current Firm Overview

Today, Lockheed Martin primarily “researches, designs, develops, manufactures, integrates, operates, and supports advanced technology systems, products and services” (*Lockheed Martin business description*, 2007). Although the firm serves global defense, civil and commercial markets, its primary focus and customer remains the U.S. Government. The following bullets provide some interesting insight regarding the firm’s current accomplishments and capabilities:

- LM’s ground systems handle more bits of data per day than all of the U.S. cable companies combined.
- LM provides the Pentagon’s Network Infrastructure Services Agency with a computer network that connects 25,000 top policy and military leaders.
- LM outsourcing provides the New York Transportation Authority with the IT infrastructure to run the world’s largest transit network.
- LM developed the Theater Battle Management Core Systems, which allow warfighters to see a complete picture of air operations in battle—deployed in Afghanistan and Iraq.
- LM’s air traffic management systems manage and control more than 60% of the world’s air traffic.
- LM’s recognition technologies and database search algorithms enable the FBI to match a fingerprint against 420 million prints in just minutes, including the one that solved the infamous DC sniper case.
- LM’s postal systems provide automated scanning, sortation and biochemical detection systems for the U.S. Postal Service.

- LM works with civilian agencies on a wide range of services, including processing for Medicare and Medicaid applications and modernizing the Social Security Administration's IT systems to assure that 45 million Americans receive correct benefit checks.
- LM's simulators train truck drivers to drive trucks, pilots to fly aircraft, and astronauts to work in space.

(Adapted from: *Lockheed Martin capabilities*, 2007)

In conjunction with utilizing Lean Six Sigma manufacturing principles, Lockheed Martin has remained competitive by introducing the Lockheed Martin Continuous Appraisal Method (CAM), an internal process-appraisal and improvement method (2007). The method can also be used in conjunction with other external metrics and process-valuation standards. These business practices help Lockheed Martin meet its vision, which is: "Powered by innovation, guided by integrity, we help our customers achieve their most challenging goals" (*About us*, 2007b). Lockheed Martin realized \$42.7 billion in 2008 sales (2009b).

D. NORTHROP GRUMMAN

Northrop Grumman provides a variety of products and services—including defense and commercial electronics, shipbuilding (nuclear and non-nuclear), information technology, mission systems, systems integration and space technology in the government and commercial sectors. As with Boeing, Northrop Grumman's primary SIC Code, 3761, represents guided missiles and space vehicles. The firm also covers three secondary SIC Codes, including: 3812, search and navigation equipment; 3489, ordnance and accessories; and 3731, ship building and repair. The firm employs 120,000 personnel and its business endeavors are split among seven business sectors covering: Electronic Systems, Newport News, Ship Systems, Information Technology, Mission Systems, Integrated Systems and Space Technology (*Northrop Grumman business description*, 2007).

1. History

Founded in 1939 as Northrop Aircraft Incorporated, Northrop Grumman's history is slightly more recent than the other focus firms in this project. During the 1940s and 1950s, the firm emphasized bombers and versatile fighter aircraft in the defense industry. By 1959, however, the firm's business began to broaden and its name was changed to Northrop Corporation to reflect these other business ventures. For example, the firm developed its first intercontinental guided missile in 1960, although it has continued developing and producing warfighting aircraft through the present. Figure 2 illustrates the significant acquisitions impacting Northrop Grumman over its 68-year history. Interestingly, Northrop Aircraft was incorporated in 1939 but the firm does not identify its first significant acquisition until 1994, 55 years into its history, when the firm merged with Grumman Corporation. Again, this visual representation is indicative of the acquisition patterns of interest in this paper, revealing that acquisitions were not favored among these major defense firms until after the Cold War.



Figure 2. Significant Acquisitions in the History of Northrop Grumman
(From: Our heritage, 2007)

Grumman Corporation's history is nine years longer than that of Northrop; the firm incorporated in 1930 in an abandoned auto garage. From that point, it grew to become known as a premier military aircraft systems integrator. Focusing on fighter aircraft prior to and during World War II, Grumman Corporation also partnered with

NASA in the 1960s. The company was responsible for landing a man on the moon's surface with its Lunar Module, supporting the 1969 launch of the Apollo Lunar Module.

2. Current Firm Overview

Today, Northrop Grumman is driven by a vision to be: "The most trusted provider of systems and technologies that ensure the security and freedom of our nation and its allies" (*Our capabilities*, 2007). The firm identifies its competencies, which enhance homeland security and large-scale civil information systems, as global diversity, improved intelligence, precise strike and missile defense—all of which work toward satisfying current and future evolving security goals (2007). Northrop Grumman's current work is vast, with a list of significant ongoing projects identified below:

- Command and control systems
- Large-scale intelligence information systems
- Missile defense systems
- Advanced radar systems
- Civil government and public-safety information systems
- Conventional and nuclear-powered naval ships
- Satellites for a wide variety of missions
- System sustainment, logistics support and training
- High-energy laser systems
- Health information systems
- Unmanned aerial vehicles

(Adapted from: *Our capabilities*, 2007)

Northrop Grumman's seven business sectors are categorized within four business areas. The first of these areas is Information and Service, which "develops systems and

solutions that deliver timely, enabling information where it is needed most for its military, intelligence, federal, state and local government, and commercial customers” (*About us*, 2007c). Electronics is the second area, which develops, manufactures and supports a variety of electronic and maritime systems for both the defense and commercial sectors. Third, the Aerospace business area focuses on manned and unmanned aircraft, spacecraft, high-energy laser systems, microelectronics and other systems and subsystems critical to maintaining the nation’s security and leadership in science and technology. The fourth business area is Ships; Northrop Grumman is the nation’s only nuclear-powered aircraft carrier manufacturer and one of only two companies that design and build nuclear-powered submarines. The business also supports the lifecycle of major U.S. Navy, U.S. Coast Guard, international and commercial surface ships. In 2008, Northrop Grumman reported net sales of \$33.9 billion (*About us*, 2009c).

E. RAYTHEON

Raytheon is engaged in many business ventures similar to the other focus firms in this project. Raytheon’s endeavors include government and defense electronics, technical services, space, information technology, and business and special mission aircraft. The primary SIC Code identified for Raytheon is 3812, indicating search and navigation equipment. Secondary SIC Codes for the company include: radio and TV communications equipment (3663); semiconductors and related devices (3674); and aircraft (3721) (*Raytheon business description*). With 73,000 employees located worldwide (*About us*, 2007c), the company operates within seven principal business groups, as follows:

- Integrated Defense Systems (IDS)
- Intelligence and Information Systems (IIS)
- Missile Systems (MS)
- Network Centric Systems (NCS)

- Space and Airborn Systems (SAS)
- Technical Services (RTSC)
- Aircraft

(Adapted from: *Raytheon business description*)

1. History

Founded as American Appliance Company in 1922, Raytheon was first poised to develop an artificially cooled refrigerator. When this business venture proved a failure, the company began developing a “gaseous rectifier,” or radio tube, which would allow radios to operate via an alternating current wall outlet, as opposed to the then-standard direct current battery. Because Raytheon was able to beat the major competitors to market with the new product, they were able to amass \$1 million in sales by the end of 1924. It was not until the onset of World War II that Raytheon entered the defense sector. At the time, Britain had developed an extremely advantageous radar system; however, they were not able to mass produce the magnetron tube required for its operation. When turned to for help, Raytheon redesigned the production process to vastly increase production capacity and improve product functionality. Starting with a small contract for these magnetron tubes at the beginning of the war, Raytheon was producing over 80% of these components by the war’s end—leaving their competition to split the remaining demand. At the same time, Raytheon also developed a shipboard radar unit, the microwave SG radar. After World War II, Raytheon continued to participate in the defense sector with a variety of products and services—including guided missile systems, NASA communications systems and transistors. In addition, Raytheon may also be credited with discovering the microwave as a cooking device in the 1950s. However, it was not until the company acquired Amana Refrigeration in 1965 that it gained the distribution channels necessary for the microwave to become a common American household appliance (*History*, 2007c).

2. Current Firm Overview

Driven by the vision: “To be the most admired defense and aerospace systems supplier through world-class people and technology,” Raytheon posted total sales of \$23.2 billion in 2008 (*About us*, 2009d). Part of the firm’s success may be attributed to its application of “Raytheon Six Sigma,” a philosophy and corporate culture of continued improvement and collaborative team-play between suppliers, Raytheon and their clients. The Raytheon Six Sigma process captures many components of a task—such as aligning projects with the firm’s current goals, challenging the status quo, committing resources to focused improvement projects, understanding and documenting current metrics, engineering control systems to maximize value and ensuring the firm delivers measurable results to its clients. Figure 3 provides a clear visual representation of the circular and interdependent nature of the elements within the Raytheon Six Sigma philosophy.



Figure 3. Raytheon Six Sigma Process (From: *About us*, 2009d)

Raytheon is currently engaged in a variety of projects, including developing a new semiconductor believed to increase radar capabilities by 10 fold, modernizing the U.S. Air Force's distributed Intelligence, Surveillance and Reconnaissance (ISR) systems, creating integrated solution sets providing total lifecycle support to the client, and ground-based, affordable airport protection systems. Each of these projects is poised to build on Raytheon's 80-year legacy of successful innovation, cutting-edge technology and solutions (*About us*, 2007d).

F. SUMMARY

In review, the focus firms of this project each share a number of similarities. Notably, each is at least partially focused in the Defense-aerospace industry; furthermore, these firms have all had long-standing involvement in the industry. With histories dating to the World War II U.S. defense build-up—and, in some cases, histories that pre-date that period—each of these firms has a long-standing industry reputation. These firms range in size from Raytheon with 73,000 employees to Boeing with approximately double that number of employees. Annual revenues reported in 2008 are also representative of the relative sizes of these firms, with Lockheed Martin and Northrop Grumman holding at the middle of the group. Table 1 provides a consolidated review of this information for each of the firms.

Firm	Number of Employees (in thousands)	2008 Annual Revenue (in billions)
Boeing	158	\$ 65.0
Lockheed Martin	146	\$ 42.7
Northrop Grumman	120	\$ 33.9
Raytheon	73	\$ 23.2

Table 1. Summary of Aerospace-industry Focus Firm's Statistics

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IV. METHODOLOGY

A. CHAPTER OVERVIEW

This chapter provides an overview of the methodology applied in the project's empirical analysis. It includes the theoretical foundation on which this study's methodology was based, data collection methods, and the process used to estimate stock price returns, both arithmetic and logarithmic.

B. THEORETICAL BASIS OF METHODOLOGY

Before exploring the methodological and analytical components of this project, it is important to discuss the theoretical basis upon which this thesis is established. The fundamental questions with regard to how quickly and how accurately the market absorbs the announcement of a corporate consolidation can be explored through an analysis of historic stock price returns, which serve as a representation of the market's evaluation of the effect on the firm's value as a result of the consolidation. More explicitly, the market's evaluation of the announcement will be ascertained from the deviation, or lack thereof, from the established pattern of stock price returns prior to the announcement date with respect to the daily return of the S&P 500 Index. Using six months of daily stock price returns prior to the consolidation announcement, an OLS regression of stock returns with respect to S&P 500 Index returns, Figure 4 provides a graphical representation of a notional linear percent return vs. the index's return over time.

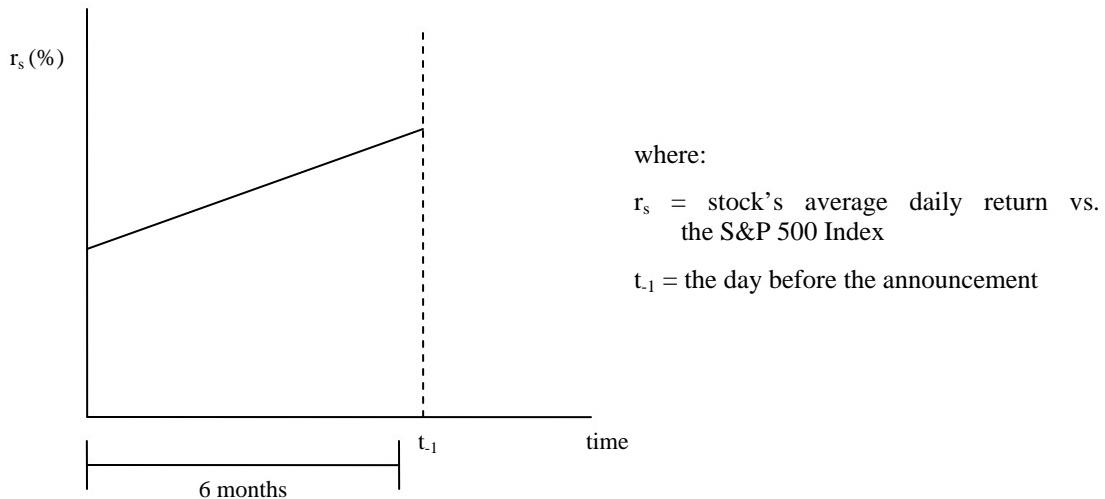


Figure 4. Historical Stock Price Returns vs. the Index

Having established a pattern of the market's valuation of the firm with respect to the S&P 500 over the 6-month period prior to the consolidation announcement, this information can be used to estimate the stock price return for some period after a consolidation announcement based on the assumption that the market's valuation of the firm has not changed since the time of the announcement. Based on the pattern found in Figure 4, Figure 5 provides the expected stock price return for the day of the announcement as well as days 10, 20 and 40 following the consolidation announcement.

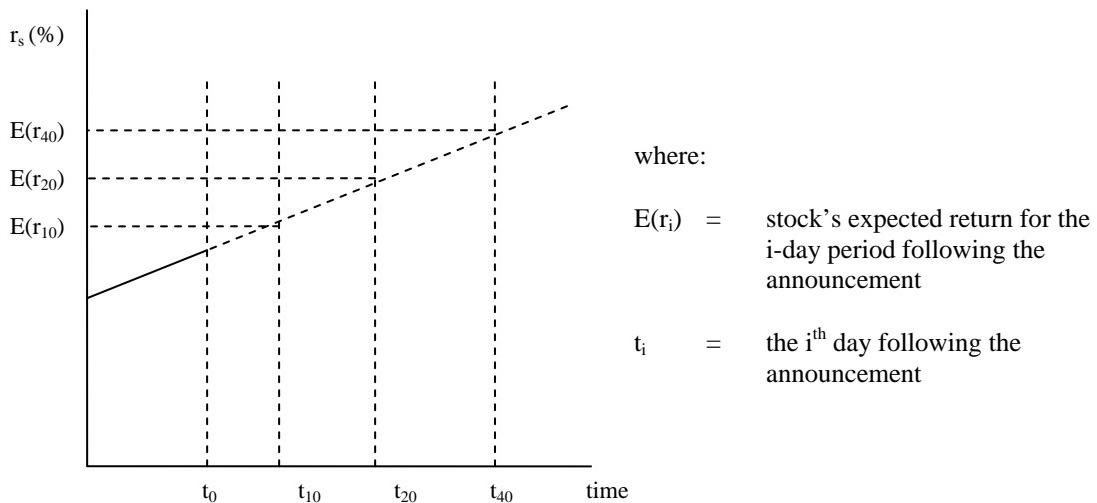
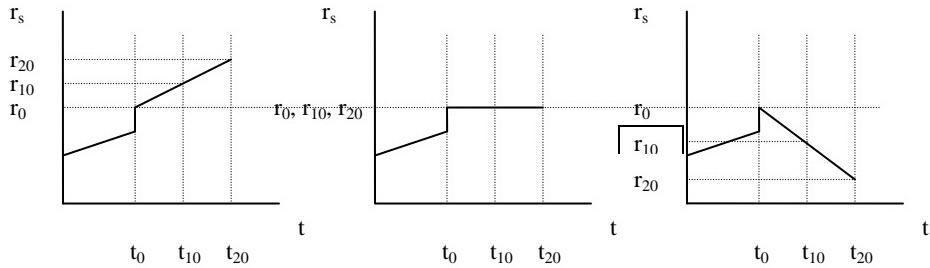


Figure 5. Expected Stock Price Returns Based on Historical Returns

Having established an expected pattern of returns based on the data prior to the announcement, one can then analyze the actual post-announcement returns to determine the impact of the corporate consolidation news. Although there are an infinite number of potential stock price behaviors that could be observed, Figure 6 provides a graphical representation of three general patterns. In reviewing these three scenarios, one will quickly observe that the market's initial reaction to the announcement is the same in all three instances; however, the result by the 20th day following the announcement is noticeably different between scenarios. The first of these observations relates to the question of how quickly the market reacts to the consolidation announcement, while the latter relates to the accuracy of that initial reaction.



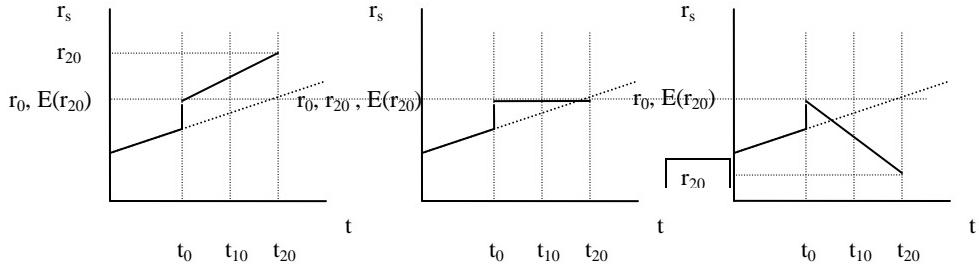
where:

r_i = the return for the i -day period following the announcement = $(P_i - P_{-1})/(P_{-1})$

Figure 6. Actual Stock Price Returns vs. the Index Following the Announcement

Figure 7, which combines the graphs in Figures 3 and 4, illustrates that while the initial market reaction is the same in these three hypothetical instances indicating the same immediate reaction from the market, in all three cases the accuracy of the market's reaction is markedly different, as indicated by the reaction of the market 20 days following the announcement.³

³ The assumption is that the later result is the more accurate, which makes sense because with the passage of time, more analysis can be performed to determine the consequences of the consolidation.



where r_i = the return for the i -day period following the announcement

Figure 7. Expected vs. Actual Stock Price Returns vs. the Index

In reflection, the three hypothetical scenarios in Figure 7 ultimately represent three different market reactions. Initially, with the news of the announcement, the market revalues the stock at time t_0 , such that r_0 and $E(r_{20})$ are equivalent. In the first scenario, the actual return follows a higher, but approximately parallel path to the return pattern established prior to the announcement. From this result, one can determine that the market quickly absorbed the information of the announcement and deemed that the consolidation would add overall value to the firm while maintaining approximately the same rate of growth. The key result is that $r_{20} > E(r_{20})$. In the second instance, r_0 , r_{20} and $E(r_{20})$ are all the same. As such, the market quickly absorbed the news of the announcement and then reevaluated its stance on the firm's value as a result of the announcement as indicated by the static return. Since $r_{20} = E(r_{20})$, the market has reevaluated its initial valuation of the post-consolidation firm from positive to neutral (i.e., initially it thought the consolidation would increase the value of the firm, but after further analysis believes it won't change the firm's value). The final scenario indicates that the market quickly reacted favorably to the news of the consolidation, thinking it would increase the value of the firm. However, as evidenced by a $r_{20} < E(r_{20})$, has revised that initial favorable evaluation to a negative evaluation. This is indicated by a declining return over time, which indicates the market thinks the consolidation will reduce the value of the firm.

The final step in the analysis was to determine if the differences between the actual and expected returns for each time period (1st, 10th, 20th, and 40th days) were statistically significant. In other words, it was determined if the difference between the actual return and the estimated return was within a calculated confidence interval or if the difference fell outside of the confidence interval and thus into the classification as an abnormal return.

C. DATA COLLECTION

The methodology includes several steps—first in collecting data and then in analyzing and interpreting the results. It should be noted that many of the findings in the literature review are based on data from The Center for Research in Security Prices (CRSP); however CRSP was not used in this research because there were no available licenses. Instead, the initial data collection of corporate consolidation dates was conducted on a Bloomberg workstation, which generated a corporate-actions calendar listing for each firm within the focus group to identify the announcement dates of corporate consolidations from January 1992 through December 2006⁴.

The specific search syntax utilized on the Bloomberg workstation is summarized in Table 2. The terms identified in the italicized quotes should be replaced with the appropriate Bloomberg value. For example, to locate the firm ticker symbol one would replace “*keyword*” with “IBM” in the Bloomberg syntax. The non-italicized phrases enclosed in quotations represent the appropriate Bloomberg search values for this specific instance; however, these values would also change to modify the search criteria. Phrases that are enclosed in carrots (< >) represent Bloomberg terminal function keys. For example, <HELP> indicates using the “F1” key on a standard keyboard. Phrases that are neither captured in quotation marks nor carrots represent search prompts within the Bloomberg environment.

⁴ Grant (2007) identified a total of 89 listings when excluding the General Dynamics results, whereas this research identified a total of 92 listings. The discrepancy is attributed to the fact that Grant only utilized actions referenced on the corporate websites for the focus firms which did not include three additional listings identified in Bloomberg. The difference is due to the fact that Bloomberg lists all consolidation announcements while the websites listed only the consolidations that were implemented. Three of the announced consolidations did not go through.

<i>Search Parameter</i>	<i>Bloomberg Search Function</i>
Firm Ticker Symbol	“Keyword” <HELP> <enter> “10” <enter>
Firm Corporate Actions Calendar Listing	“Ticker Symbol” “Country” <EQUITY> “CACS” <enter> Action Specification: “21” for acquisition, “44” for merger Date Range Specification: 01-01-1992 through 12-31-2006 Record Type: “Announce”

Table 2. Summary of Bloomberg Workstation Search Functions

To serve as an example, Table 3 illustrates the Table 2 search criteria applied to IBM. The search demonstrated in Table 3 will identify the correct Bloomberg ticker symbol for IBM, a listing of all of the acquisitions and mergers associated with IBM between 1 January 1980 and 31 December 2006.

<i>Search Parameter</i>	<i>Bloomberg Search Function</i>
Firm Ticker Symbol	“IBM” <HELP> <enter> “10” <enter>
Firm Corporate Actions Calendar Listing	“IBM” “US” <EQUITY> “CACS” <enter> Action Specification: “21” for acquisition, “44” for merger Date Range Specification: 01-01-1980 through 12-31-2006 Record Type: “Announce”

Table 3. Example of Bloomberg Workstation Search Functions for IBM

The subsequent data collection was conducted using *Yahoo Finance*. This data included the historic daily closing stock prices, which were collected for the same set of focus firms. In conjunction with collecting the firms’ historic stock prices, historic closing prices were also collected for the Standard and Poor’s 500 (S&P 500) Index⁵ to serve as the explanatory variable in the event-study analysis.

⁵ Another approach would be to utilize a defense-industry-specific index, however, since the research deals with major defense contractors it would be necessary to disaggregate the focus firm from the index if this approach were used.

D. EVENT STUDY METHODOLOGY

The second component of the methodology involved event studies based on the corporate consolidation listings. The event studies were conducted utilizing two techniques in an OLS regression analysis—namely, estimating both the arithmetic return and the logarithmic return to determine the estimation method most applicable for the analysis.

1. Calculation of the Daily Arithmetic Return

The arithmetic return for the daily stock prices was calculated by dividing the difference between the historic stock price⁶ on a particular date (i.e., either the day of the consolidation announcement or the 1st, 10th, 20th, or 40th day following the announcement) and the closing price one trading day prior to the consolidation announcement date (note that this is not necessarily the prior calendar day as weekends, holidays and other non-trading days must be accounted for) by the closing price on the day prior to the announcement. Equation 1 presents a generic mathematical representation of the calculation.

Equation 1. Daily Arithmetic Return

$$\text{Arithmetic Return} = \frac{(P_n - P_{-1})}{P_{-1}} ;$$

where: P_n = historic price on the n^{th} day
following the announcement; and
where $n = 0, 1, 10, 20$

P_{-1} = historic price one trading day prior
to the consolidation announcement

2. Calculation of the Daily Logarithmic Return

The daily logarithmic return was calculated utilizing the same historic data; however, a different formula was used. Instead of calculating the difference between the

⁶ For the purpose of this project, historic stock price refers to the adjusted historic closing price which was selected because it has been corrected for dividend payments. This is an important clarification because any dividend payment should also be considered with regard to a stockholder's return on investment.

two historic prices and dividing by the historic price on the trading day prior to the announcement, the logarithmic return was calculated by computing the difference between the natural log of the historic price on the n^{th} day following the announcement and the natural log of the historic price on the trading day prior to the announcement. Equation 2 provides a mathematical representation of this calculation.

Equation 2. Daily Logarithmic Return

$$\text{Logarithmic Return} = \ln P_n - \ln P_{-1};$$

where: P_n = historic price on the n^{th} day following the announcement;
where $n=0, 1, 10, 20 or } 40; and
 P_{-1} = historic price one trading day prior to the consolidation announcement$

3. Applying Arithmetic Return vs. Logarithmic Return Calculations

It is important to take a moment to consider the similarities and differences between these two calculations. It is often argued that the two calculations will closely approximate one another. However, this argument depends on one important caveat—when the value of the difference between the two historic prices (i.e., P_n and P_{-1}) approaches 0, then the two calculations will yield similar results. The calculations will yield increasingly different results as the differences between the historic prices increase (Aas).

Because this project was concerned with daily stock price returns in a relatively stable industry, and because the OLS models were generally based on 6 months of historical data, it is not surprising that the results between the two analyses are similar. In a more volatile market with greater variation in daily prices, one would expect to see greater discrepancies between the two calculations.

4. Application of the OLS Regression Model

The event studies consisted of an OLS regression analysis to estimate the firm's daily return with respect to the S&P 500's daily return. The population model applied in the regression analysis estimates the daily stock return as a function of the S&P 500

index' return for that day. It is important to note that the same population model is applied in the estimated sample models for both the arithmetic and logarithmic returns. The generalized population model is as follows:

Equation 3. Generalized Population Model

$$\text{Daily Stock Return} = B_0 + B_1(\text{Index Return}) + u$$

This population model was applied to the historic prices for the 130 trading day range (~6 months) prior to the corporate-action listing, when 130 trading days were available for that firm that did not include a different consolidation announcement. Where a 130 trading day window was not available, a regression was run with a sample of 30⁷ prior trading days. In instances for which there were fewer than 30 trading days between consolidation announcements, the regression results for the previous record were used for the estimations and analyses. These adjustments reflect the concern that including additional corporate actions records within the estimated model would bias the estimated results. Table 4 provides the specific breakdowns for the four focus firms and the number of regression estimates, which were computed under each of the three above scenarios.

	Total number of available CACS Listings	≥ 130 days of available data	30 – 129 days of available data	< 30 days of available data
Boeing	22	9	9	4
Lockheed Martin	26	8	10	8
Northrop Grumman	26	11	8	7
Raytheon	18	8	7	3

Table 4. Breakdown of CACS Listings with Applicable Data Available for OLS Regression Estimates

⁷ This value was selected by the researcher as the minimum number of observations which would yield robust results for the parameter estimates. Although more data would be preferable (such as 60 days), 30 days of data seemed to be an appropriate figure as it would not exclude a significant number of the instances while serving as a consistent standard allowing for generalizations to be made across the results.

The parameter estimates from the above-described regression were then used to estimate the stock's expected return on the day of the corporate action, as well as for the 1st, 10th, 20th and 40th trading days following the announcement. Because the consolidation announcement listings extracted from Bloomberg did not provide a specific time at which the announcement was made, it could not be verified if the announcement was made in the morning, the afternoon, or after trading had closed. As this timing would impact the market's ability to react to the news release, it was decided that only the maximum absolute value between the return on the day of and the day following the announcement would be used as an indicator of the market's immediate reaction to the announcement. The purpose for choosing the subsequent dates was to determine if there is a pattern of the market either maintaining or reconsidering its initial reaction to consolidation announcements. Furthermore, the longer-term perspective should also yield insight into the accuracy of the market's original reaction to the announcement.

E. CALCULATION OF ABNORMAL DAILY STOCK PRICE RETURNS

The final step in the methodology was to calculate the difference between the estimated stock return and the actual stock return to determine if the stock experienced an abnormal return following the consolidation announcement for the various periods analyzed (i.e., 1, 10, 20, and 40 days). Once the difference between the estimated and actual returns was calculated, a t-statistic and associated p-value was calculated to analyze the statistical significance of the difference (i.e., to determine if the actual return was abnormally high or low). A two-tailed hypothesis test was applied to analyze all p-values, with a null hypothesis that the estimated and actual returns were equal (i.e., $H_0: r_{est} = r_{act}$). In contrast, the alternative hypothesis was that the estimated and actual returns were not equal (i.e., $H_a: r_{est} \neq r_{act}$). The general formula used for a 2-tailed confidence interval was:

Equation 4. 2-tailed Confidence Interval

$$\bar{x} \pm Z_{\alpha/2} s$$

where:

\bar{x} = expected return,

s = standard deviation of the return,

$1-\alpha$ = confidence level of the statistical test, and

Z represents the normal distribution.

In this analysis a 95% confidence interval with 2-tailed hypothesis test was applied. A normal distribution of historic stock price returns is assumed. Appendix 3 provides histograms of both the arithmetic and logarithmic returns for each of the focus firms, each of which generally mirrors a normal distribution. As such, the following general equation for determining the confidence interval will be applied.

Equation 5. 95% Confidence Interval for Each Time Period

$$\bar{x}_i \pm (1.96)s_i$$

where:

i = number of days following the announcement

$$\bar{x}_i = [(1 + \bar{x})^i - 1]$$

$$s_i = (s)(i)$$

The results of the analysis are presented in Chapter V.

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V. DATA ANALYSIS

A. CHAPTER OVERVIEW

This chapter provides the results of the data analysis as described in Chapter IV. Generalizations will be drawn concerning the impact of these corporate consolidations on the focus firms.

B. DISTRIBUTION OF CORPORATE CONSOLIDATIONS

Figure 8 shows the number of corporate consolidations that involved the focus firms between January 1991 and December 2006. As the figure indicates, the first consolidation occurred in 1992 with a varied number of consolidations transpiring each year through 2006.

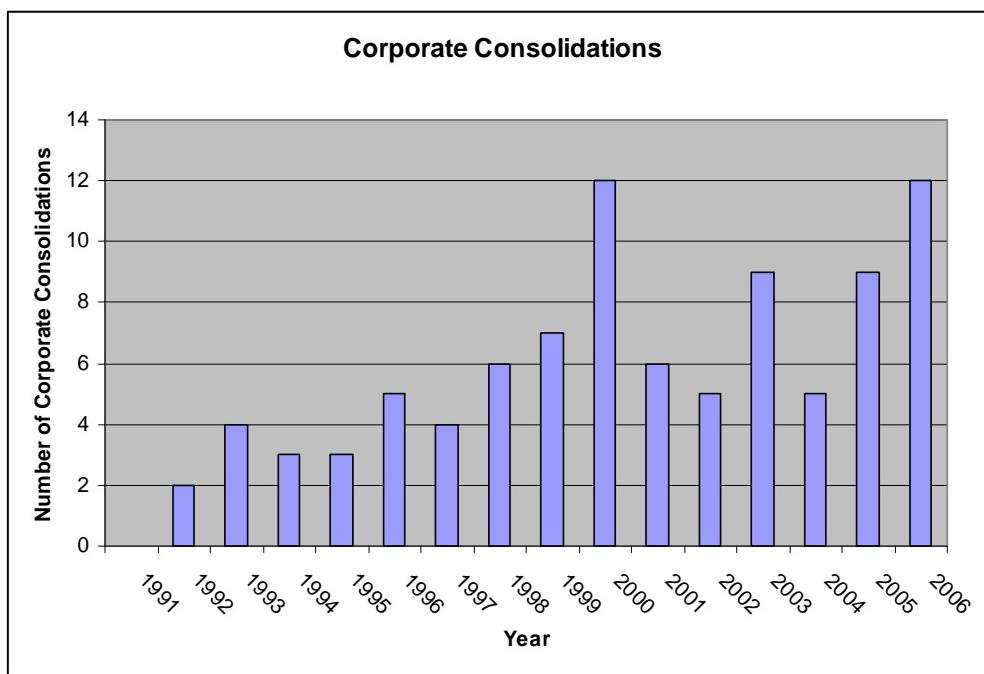


Figure 8. Volume of Corporate Consolidations by Year

Following is a summary of the findings regarding estimated daily stock price returns and apparent abnormal returns associated with the announcement of corporate consolidations.

C. ESTIMATED AND ACTUAL STOCK RETURNS OF THE FOCUS FIRMS

This section summarizes the findings of these calculations. After each focus firm is reviewed separately, general summary results will also be provided. Appendix 4 provides a more detailed summary of the regression and analysis results for each consolidation announcement.

1. Boeing

In total, there were 22 corporate-actions calendar listings for mergers and acquisitions pertaining to Boeing. Table 5 reports the instances of normal, positive abnormal and negative abnormal returns for both the arithmetic and logarithmic calculations. The data indicate that on the day of or day following the announcement, 91% of the cases demonstrated abnormal arithmetic and abnormal logarithmic returns.

Boeing	Arithmetic Returns	Logarithmic Returns		
Number of Consolidations	22	22		
Average Adjusted R Square	0.2192	0.2200		
Max Adjusted R Square	0.4956	0.4958		
	Day 1 or 2	Day 10	Day 20	Day 40
Normal Arithmetic Returns	2	9	9	7
Normal Logarithmic Returns	2	9	9	7
Abnormal Positive Arithmetic Returns	15	10	10	9
Abnormal Positive Logarithmic Returns	15	10	10	9
Abnormal Negative Arithmetic Returns	5	3	3	6
Abnormal Negative Logarithmic Returns	5	3	3	6

Table 5. Summary of Analysis Results for Boeing

The first pattern to consider in reviewing the returns for Boeing presented in Table 6/Figure 9 is the pattern of accurate market reactions, that is instances where the initial return characteristic (i.e. normal, positive abnormal or negative abnormal) matches the return characteristic on the 40th trading day. As the tables indicate, this pattern

occurs 37% of the time. Closely following is the pattern of a corporate consolidation beginning with an abnormal return (whether positive or negative) and then fluctuating to end with a statistically significant abnormal return with the opposite sign on the 40th trading day than was observed on the 1st trading day. This pattern occurs 32% of the time and is of particular interest to note because not only did the market reexamine its initial valuation of the consolidation, but it went so far as to determine that the consolidation would have an opposite impact on the stock price return. Additionally, 27% of the time, the market reacted with an abnormal return on the first day of the announcement, fluctuating its behavior over days 10 and 20, but eventually returning to the same type of abnormal return (whether positive or negative) by the 40th trading day. This result indicates that although the market fluctuated in its evaluation of the consolidation announcement, by the 40th trading day the market was in agreement with its initial evaluation. There were 27% of cases in which the market began with a statistically significant abnormal return on the day of the consolidation announcement, eventually revising the valuation to reflect a normal return by the 40th trading day. Although other infrequent patterns exist, it is also perhaps of note to mention that only 5% of the cases (or 1 case total) was observed to retain an abnormal return of the same sign across days 1, 10, 20 and 40. With regard to Boeing this was a positive abnormal return. It should be noted that the results in Table 6 and Figure 9 do not differentiate between arithmetic and logarithmic returns because the patterns are the same between the two calculation methods.

Day 0/1	Day 40	# of Occurrences	Percent	Intervening Pattern	
				Consistent	Fluctuating
+	+	6	27%	1	5
+	0	5	23%		
+	-	4	18%		
0	+	0	0%		
0	0	1	5%		0
0	-	1	5%		
-	+	3	14%		
-	0	1	5%		
-	-	1	5%	0	1

Table 6. Return Patterns for Boeing

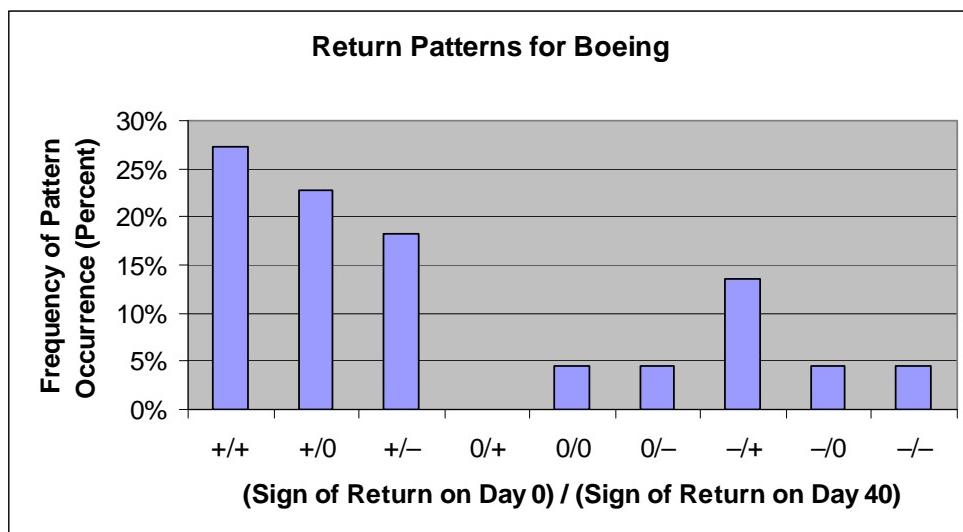


Figure 9. Return Patterns for Boeing

Table 7 provides a breakout of the specific return patterns occurring for each announcement date. Furthermore, Appendix 4 provides the specific regression data associated with these results.

Boeing	Arithmetic Return				Logarithmic Return			
	Date of Announcement	Day 0/1	Day 10	Day 20	Day 40	Day 0/1	Day 10	Day 20
3-Jan-95	+	0	+	-	+	0	+	-
1-Aug-96	+	0	0	+	+	0	0	+
16-Dec-96	-	0	0	+	-	0	0	+
18-Mar-98	+	+	0	-	+	+	0	-
8-Feb-99	-	0	-	+	-	0	-	+
2-Jul-99	+	0	0	0	+	0	0	0
13-Jan-00	+	0	-	-	+	0	-	-
1-Jun-00	+	+	0	0	+	+	0	0
27-Jun-00	+	+	0	+	+	+	0	+
2-Aug-00	+	+	0	+	+	+	0	+
15-Aug-00	+	0	0	0	+	0	0	0
1-Sep-00	+	0	+	+	+	0	+	+
17-Oct-00	0	+	+	0	0	+	+	0
27-Jul-01	+	+	+	+	+	+	+	+
18-Dec-01	+	+	+	0	+	+	+	0
23-Sep-02	-	-	+	-	-	-	+	-
10-Jan-03	+	-	+	-	+	-	+	-
4-May-04	+	+	+	0	+	+	+	0
29-Sep-04	+	-	+	+	+	-	+	+
3-Mar-06	-	0	0	0	-	0	0	0
1-May-06	0	+	-	-	0	+	-	-
18-Aug-06	-	+	+	+	-	+	+	+

Where:

"+" indicates a statistically significant positive abnormal return,
 "—" indicates a statistically significant negative abnormal return, and
 "0" indicates a non-statistically significant return (i.e., a normal return).

Table 7. Boeing's Pattern of Returns Over the 40-day Period for Each Event

2. Lockheed Martin

Lockheed Martin yielded a total of 26 event-announcement days suitable for analysis. Table 8 reports the instances of normal, positive abnormal and negative abnormal returns for both the arithmetic and logarithmic calculations. An initial review of the reported findings for Lockheed Martin closely mimics those of Boeing, with 96% of the returns on the day of or the day following the announcement demonstrating statistically significant abnormal returns.

Lockheed Martin	Arithmetic Returns	Logarithmic Returns		
Number of Consolidations	26	26		
Average Adjusted R Square	0.1356	0.1347		
Max Adjusted R Square	0.4511	0.4522		
	Day 1 or 2	Day 10	Day 20	Day 40
Normal Arithmetic Returns	1	5	10	8
Normal Logarithmic Returns	1	5	10	8
Abnormal Positive Arithmetic Returns	15	15	10	11
Abnormal Positive Logarithmic Returns	15	15	10	11
Abnormal Negative Arithmetic Returns	10	6	6	7
Abnormal Negative Logarithmic Returns	10	6	6	7

Table 8. Summary of Analysis Results for Lockheed Martin

Taking a similar approach with the Lockheed Martin pattern of returns (Table 9/Figure10), one will find similar patterns as those of Boeing. For example, 47% of the Lockheed Martin cases began with a statistically significant abnormal return on day 1 and ended with a statistically significant abnormal return on day 40, which agreed in sign to the abnormal return observed on day 1. There were 0 cases in which a normal return was observed on both the initial trading day and the 40th trading day. There were, however, 31% of the Lockheed Martin cases that began with a statistically significant abnormal return on day 1 that the market revised to a normal return by the 40th trading day. There are also some Lockheed Martin patterns that are dissimilar to those of Boeing. For example, at 27%, Lockheed Martin experienced a much higher proportion of cases in which the market retained a statistically abnormal return with a consistent sign across days 1, 10, 20 and 40. Of the 7 cases, there were 5 in which a statistically significant positive abnormal return was retained while the remaining 2 were instances where a statistically significant negative abnormal return was retained. Cases of the market beginning with an abnormal return of a particular sign on day 1 and ending with an abnormal return of the opposite sign by day 40 were less frequent with regard to Lockheed Martin as this pattern only existed across only 20% of the cases in contrast to Boeing where this occurred 32% of the time. Again, it should be noted that Table 9 and Figure 10 do not differentiate between arithmetic and logarithmic returns because the patterns for the two estimation methods are the same.

Day 0/1	Day 40	# of Occurrences	Percent	Intervening Pattern	
				Consistent	Fluctuating
+	+	9	35%	5	4
+	0	2	8%		
+	-	4	15%		
0	+	1	4%		
0	0	0	0%		0
0	-	0	0%		
-	+	1	4%		
-	0	6	23%		
-	-	3	12%	2	1

Table 9. Return Patterns for Lockheed Martin

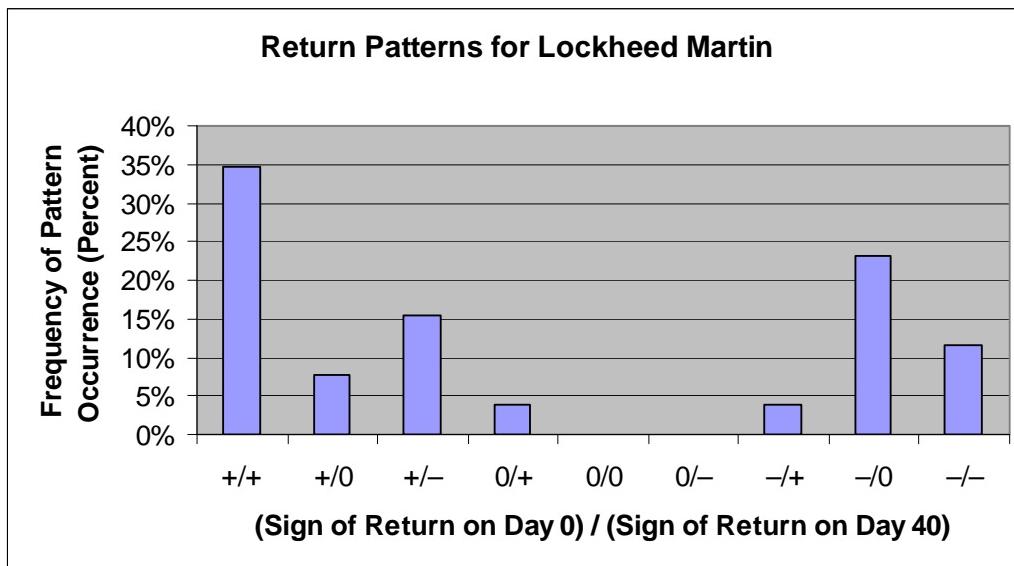


Figure 10. Return Patterns for Lockheed Martin

Table 10 provides a breakout of the specific return patterns that were found for each of the consolidation announcements. Furthermore, Appendix 4 provides the specific regression data associated with these results.

Lockheed Martin	Arithmetic Return				Logarithmic Return			
	Date of Announcement	Day 0/1	Day 10	Day 20	Day 40	Day 0/1	Day 10	Day 20
23-Nov-92	+	0	0	+	+	0	0	+
9-Dec-92	-	0	0	0	-	0	0	0
30-Aug-94	+	+	+	+	+	+	+	+
8-Jan-96	+	+	+	+	+	+	+	+
3-Jul-97	+	-	0	0	+	-	0	0
26-Feb-98	+	+	0	-	+	+	0	-
14-Dec-98	+	+	-	+	+	+	-	+
8-Jan-99	-	+	+	-	-	+	+	-
26-Oct-01	+	+	+	+	+	+	+	+
11-Mar-03	-	0	0	0	-	0	0	0
15-May-03	+	+	-	+	+	+	-	+
1-Aug-03	+	+	+	+	+	+	+	+
15-Sep-03	+	+	+	-	+	+	+	-
29-Oct-03	-	-	-	0	-	-	-	0
5-Nov-03	-	-	0	0	-	-	0	0
29-Oct-04	+	+	0	+	+	+	0	+
13-Dec-04	+	+	-	-	+	+	-	-
18-Feb-05	0	+	0	+	0	+	0	+
16-Aug-05	-	-	-	-	-	-	-	-
8-Sep-05	-	-	-	-	-	-	-	-
16-Dec-05	-	+	0	+	-	+	0	+
23-Jan-06	+	0	0	0	+	0	0	0
4-May-06	+	-	+	-	+	-	+	-
12-Jun-06	-	+	+	0	-	+	+	0
17-Aug-06	+	+	+	+	+	+	+	+
21-Dec-06	-	0	+	0	-	0	+	0

Where:

"+" indicates a statistically significant positive abnormal return,
 "—" indicates a statistically significant negative abnormal return, and
 "0" indicates a non-statistically significant return (i.e., a normal return).

Table 10. Lockheed Martin's Pattern of Returns Over the 40-day Period
for Each Event

3 Northrop Grumman

Providing a total of 26 applicable corporate consolidation announcement records, Table 11 reports the consolidated results found for Northrop Grumman. Similar to

Boeing and Lockheed Martin, 100% of the arithmetic and logarithmic returns were found to be abnormal and statistically significant on the day of or the day following the announcement of the corporate consolidation.

Northrop Grumman	Arithmetic Returns	Logarithmic Returns		
Number of Consolidations	26	26		
Average Adjusted R Square	0.1240	0.1243		
Max Adjusted R Square	0.2570	0.2584		
	Day 1 or 2	Day 10	Day 20	Day 40
Normal Arithmetic Returns	0	7	5	7
Normal Logarithmic Returns	0	7	5	8
Abnormal Positive Arithmetic Returns	11	10	14	11
Abnormal Positive Logarithmic Returns	11	10	14	10
Abnormal Negative Arithmetic Returns	15	9	7	8
Abnormal Negative Logarithmic Returns	15	9	7	8

Table 11. Summary of Analysis Results for Northrop Grumman

In exploring the abnormal return patterns of Northrop Grumman (Table 12/Figure 11 for arithmetic return patterns and Table 13/Figure 12 for logarithmic return patterns), one trend that is similar to those of Boeing and Lockheed Martin is that 27% of the cases began with an abnormal return but were eventually reevaluated by the market to be a normal return by the 40th trading day. Furthermore, 38% of the cases began and ended the trial period with the same sign on the return. Of these, 27% of the consolidations fluctuated return signs between the 1st and 40th trading days and 12% retained a consistent sign during days 1, 10, 20 and 40. Specifically, there was 1 case in which a positive abnormal return was consistently observed and 2 cases in which a consistently negative abnormal return was observed. Like Lockheed Martin, there were 0 cases in which a normal return was observed on both the 1 trading day as well as the 40th trading day. Northrop Grumman was also comparable to Boeing in that 35% of the arithmetic returns began with an abnormal return that was reevaluated by the market as an abnormal return of the opposite sign by the 40th trading day (this proportion was 31% for the logarithmic returns). Northrop Grumman also displays trends that are dissimilar to those described for the previous two focus firms.

Day 0/1	Day 40	# of Occurrences	Percent	Intervening Pattern	
				Consistent	Fluctuating
+	+	5	19%	1	4
+	0	3	12%		
+	-	3	12%		
0	+	0	0%		
0	0	0	0%		0
0	-	0	0%		
-	+	6	23%		
-	0	4	15%		
-	-	5	19%	2	3

Table 12. Arithmetic Return Patterns for Northrop Grumman

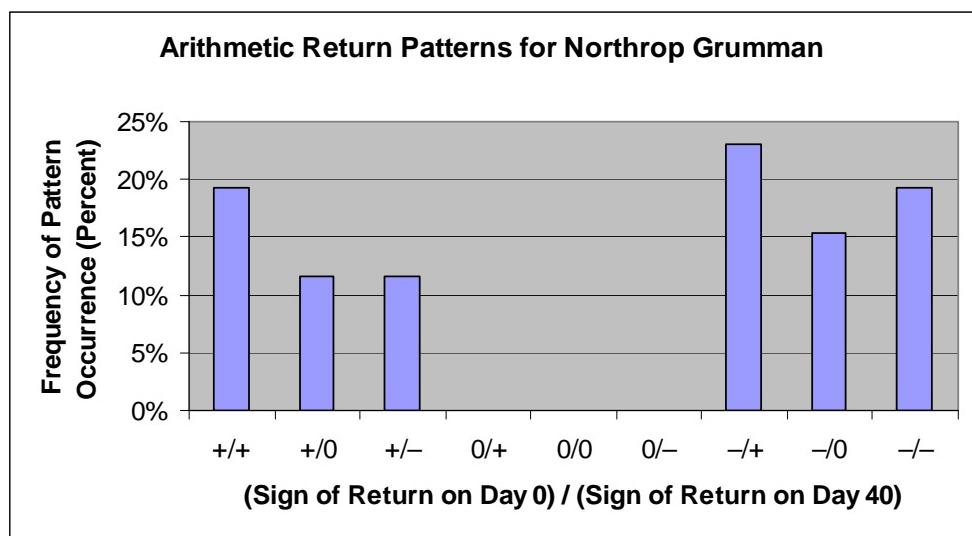


Figure 11. Arithmetic Return Patterns for Northrop Grumman

Day 0/1	Day 40	# of Occurrences	Percent	Intervening Pattern	
				Consistent	Fluctuating
+	+	5	19%	1	4
+	0	3	12%		
+	-	3	12%		
0	+	0	0%		
0	0	0	0%		0
0	-	0	0%		
-	+	5	19%		
-	0	5	19%		
-	-	5	19%	2	3

Table 13. Logarithmic Return Patterns for Northrop Grumman

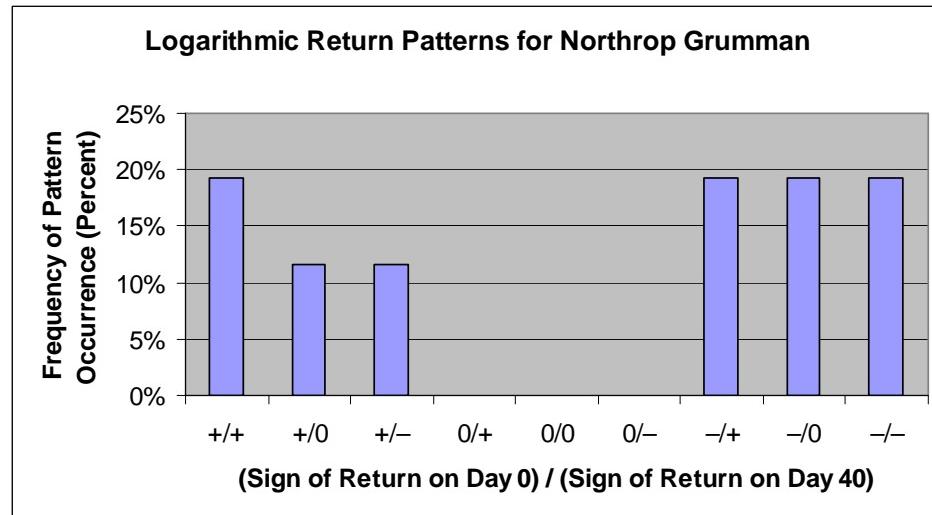


Figure 12. Logarithmic Return Patterns for Northrop Grumman

Table 14 provides a breakout of the specific return patterns that were found for each of the consolidation announcements. Furthermore, Appendix 4 provides the specific regression data associated with these results.

Northrop Grumman	Arithmetic Return				Logarithmic Return			
	Date 0/1	Day 10	Day 20	Day 40	Date 0/1	Day 10	Day 20	Day 40
4-Apr-94	+	-	+	+	+	-	+	+
3-Jan-96	-	-	+	-	-	-	+	-
5-May-97	+	+	-	+	+	+	-	+
10-Aug-98	-	+	+	-	-	+	+	-
21-Aug-98	-	-	-	0	-	-	-	0
11-Mar-99	-	+	-	+	-	+	-	0
19-May-99	-	-	-	-	-	-	-	-
27-May-99	-	-	-	-	-	-	-	-
12-Nov-99	-	0	-	0	-	0	-	0
10-Apr-00	-	0	0	0	-	0	0	0
12-Jun-00	+	+	+	+	+	+	+	+
6-Sep-00	+	0	+	0	+	0	+	0
18-Sep-00	+	0	+	-	+	0	+	-
21-Dec-00	+	-	+	0	+	-	+	0
6-Apr-01	+	-	+	+	+	-	+	+
20-Apr-01	-	+	+	+	-	+	+	+
9-May-01	+	-	+	-	+	-	+	-
22-Feb-02	-	+	+	+	-	+	+	+
6-Dec-02	-	+	0	-	-	+	0	-
18-Dec-02	-	0	0	+	-	0	0	+
24-Jul-03	+	0	0	0	+	0	0	0
31-Jan-05	+	0	+	+	+	0	+	+
18-Feb-05	-	+	-	+	-	+	-	+
21-Sep-05	-	-	+	+	-	-	+	+
21-Mar-06	+	+	+	-	+	+	+	-
8-Nov-06	-	+	0	0	-	+	0	0

Where:

"+" indicates a statistically significant positive abnormal return,
"−" indicates a statistically significant negative abnormal return, and
"0" indicates a non-statistically significant return (i.e., a normal return).

Table 14. Northrop Grumman's Pattern of Returns Over the 40-day Period for Each Event

4. Raytheon

The final focus firm, Raytheon, yielded 18 corporate-action listings. Table 15 reports the instances of normal, positive abnormal and negative abnormal returns for both the arithmetic and logarithmic calculations. Although slightly lower than the first two firms reviewed, these results are more consistent with those of Boeing and Lockheed

Martin than with those of Northrop Grumman, in that 89% of the abnormal returns were found to be statistically significant on the day of or the day following the corporate consolidation announcement.

Raytheon	Arithmetic Returns	Logarithmic Returns		
Number of Consolidations	18	18		
Average Adjusted R Square	0.1771	0.1772		
Max Adjusted R Square	0.3360	0.3326		
	Day 1 or 2	Day 10	Day 20	Day 40
Normal Arithmetic Returns	2	4	4	7
Normal Logarithmic Returns	2	4	4	7
Abnormal Positive Arithmetic Returns	10	11	9	6
Abnormal Positive Logarithmic Returns	10	11	9	6
Abnormal Negative Arithmetic Returns	6	3	5	5
Abnormal Negative Logarithmic Returns	6	3	5	5

Table 15. Summary of Analysis Results for Raytheon

In reviewing the return patterns for Raytheon (Table 16/Figure 13), 34% of the cases demonstrate the same sign on the 1st and 40th trading days. Raytheon is comparable to Boeing in that 28% of the cases began with an abnormal return of a particular sign before ending with an abnormal return on an opposite sign. In addition, Raytheon is similar to Lockheed Martin in that 17% of the cases began and ended with an abnormal return of the same sign despite fluctuations in the return behavior on the 10th and 20th trading days. The final pattern to note is that Raytheon and Northrop Grumman experienced parallel instances of abnormal returns with a consistent sign on days 1, 10, 20 and 40. With Raytheon, this was 11% of the cases (both of which were a positive abnormal return).

Day 0/1	Day 40	# of Occurrences	Percent	Intervening Pattern	
				Consistent	Fluctuating
+	+	4	22%	2	2
+	0	3	17%		
+	-	3	17%		
0	+	0	0%		
0	0	1	6%		0
0	-	1	6%		
-	+	2	11%		
-	0	3	17%		
-	-	1	6%	0	1

Table 16. Return Patterns for Raytheon

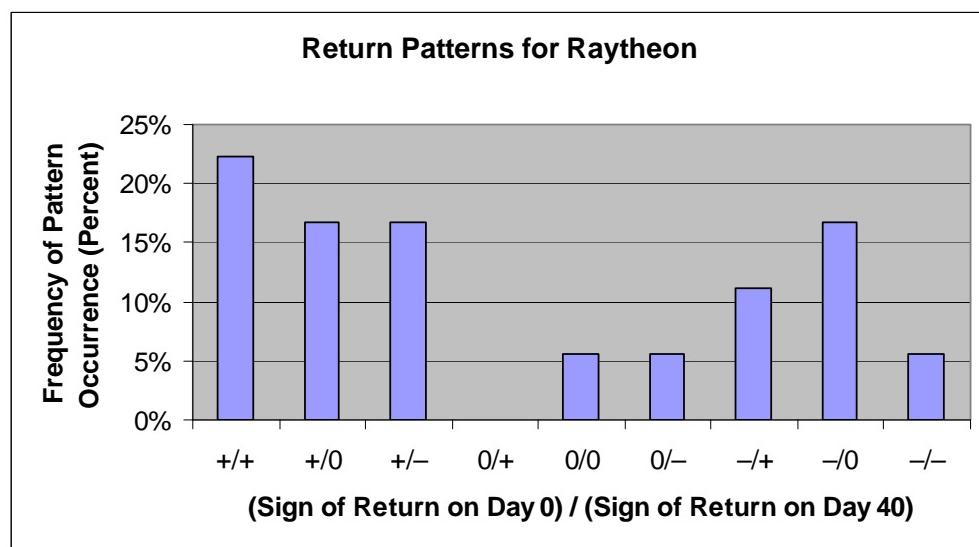


Figure 13. Return Patterns for Raytheon

Table 17 provides a breakout of the specific return patterns that were found for each of the Raytheon consolidation announcements. Furthermore, Appendix 4 provides the specific regression data associated with these results.

Raytheon	Arithmetic Return				Logarithmic Return			
	Date of Announcement	Day 0/1	Day 10	Day 20	Day 40	Day 0/1	Day 10	Day 20
20-Jan-93	+	+	-	+	+	+	-	+
17-Feb-93	-	+	0	0	-	+	0	0
1-Jun-93	+	0	0	0	+	0	0	0
17-Nov-93	-	0	0	0	-	0	0	0
9-Sep-94	-	-	+	-	-	-	+	-
3-Apr-95	+	+	+	+	+	+	+	+
30-Jun-95	+	+	0	0	+	+	0	0
8-Apr-96	-	+	+	+	-	+	+	+
6-Jan-97	+	-	-	-	+	-	-	-
16-Jan-97	+	+	+	+	+	+	+	+
21-Jul-98	-	-	+	+	-	-	+	+
20-Dec-02	+	0	-	-	+	0	-	-
25-Jul-03	+	+	-	-	+	+	-	-
6-Oct-04	+	+	+	0	+	+	+	0
22-Aug-05	0	+	-	-	0	+	-	-
29-Dec-05	0	+	+	0	0	+	+	0
24-Jan-06	+	0	+	+	+	0	+	+
5-Jul-06	-	+	+	0	-	+	+	0

Where:

"+" indicates a statistically significant positive abnormal return,
 "—" indicates a statistically significant negative abnormal return, and
 "0" indicates a non-statistically significant return (i.e., a normal return).

Table 17. Raytheon's Pattern of Returns over the 40-day Period for each Event

5. Focus Firm Summary

In considering the patterns of daily returns, there was only one pattern that was relatively consistent across all 4 focus firms. Approximately 30% of the cases can be expected to begin with an abnormal return that is eventually reevaluated by the market by the 40th trading day to be a normal return. Aside from this pattern, though, other similarities exist between 2–3 of the focus firms, but there are no other patterns that appear consistently for all 4 focus firms.

Another factor worth considering is the behavior of the adjusted R-square value. With average adjusted R-square values ranging from a low with Northrop Grumman at 0.12 to a high for Boeing at 0.22 one notices that roughly only 10-20% of the variation in the dependent variable was explained by the variation in the independent variable, which

is evidence that other factors influenced the historic closing prices of these stocks, which were not being captured in the S&P 500 index. The adjusted R-square value never exceeded 0.50. Although the average adjusted R-square values are seemingly low, these findings are generally consistent with the findings of the other research reviewed during the course of this project.

Following, Tables 18, 19 and 20 provide the aggregate proportions of events that provided normal returns, statistically significant abnormal positive returns and statistically significant abnormal negative returns for both the arithmetic and logarithmic calculations. When reviewing the aggregate arithmetic results there are a few points of interest to note. The first is that there is overall a higher instance of statistically significant abnormal returns on the day of or the day following the announcement with the data never exceeding 11% of cases with normal returns on those days. Although the instances of statistically significant abnormal returns do begin to fall slightly beginning the 10th day, it is important to note that at least 59% of the cases demonstrate instances of statistically significant abnormal results. This finding can be taken to indicate that the market reacted to the announcement news over the 40-day period. Whether the reaction was accurate or not depended on the fluctuations of those statistically significant abnormal returns.

Day 1 / 40 Abnormal Returns	Boeing	Lockheed Martin	Northrop Grumman	Raytheon
+ / +	27	35	19	22
- / -	5	12	19	6
Total	32	47	38	28
+ / -	18	15	12	17
- / +	14	4	23	11
Total	32	19	35	28

Table 18. Comparison of Result Consistency (Arithmetic Returns)

One point indicated in Table 18 is that the sign of the abnormal returns (i.e., positive or negative) are almost as likely to be the different on day 1 and day 40 as they are to be the same. This pattern which exists with all of the focus firms except for

Lockheed Martin, suggests that the market is quick to react to the news of a consolidation, but later changes its perception of the announcement as often as it maintains a consistent evaluation of the announcement.

Arithmetic Results	Percentage of Events with Normal Returns	Percentage of Events with Statistically Significant Abnormal Positive Returns	Percentage of Events with Statistically Significant Abnormal Negative Returns
Boeing			
Day 1 or 2	9.1%	68.2%	22.7%
Day 10	40.9%	45.5%	13.6%
Day 20	40.9%	45.5%	13.6%
Day 40	31.8%	40.9%	27.3%
Lockheed Martin			
Day 1 or 2	3.8%	57.7%	38.5%
Day 10	19.2%	57.7%	23.1%
Day 20	38.5%	38.5%	23.1%
Day 40	30.8%	42.3%	26.9%
Northrop Grumman			
Day 1 or 2	0.0%	42.3%	57.7%
Day 10	26.9%	38.5%	34.6%
Day 20	19.2%	53.8%	26.9%
Day 40	26.9%	42.3%	30.8%
Raytheon			
Day 1 or 2	11.1%	55.6%	33.3%
Day 10	22.2%	61.1%	16.7%
Day 20	22.2%	50.0%	27.8%
Day 40	38.9%	33.3%	27.8%

Table 19. Summary of Arithmetic Return Results

Also of note is the observation that the arithmetic results in Table 19 and the logarithmic results in Table 20 are generally consistent thus indicating that the different estimation methods yield consistent findings. In fact, in reviewing the discrepancies, one finds that there is actually only one instance where the results of the estimation methods differ. This particular instance occurred on the 40th trading day in the Northrop Grumman data. The arithmetic return method indicated that there were seven instances of normal returns and 11 instances of statistically significant abnormal positive returns. In contrast, the logarithmic return method indicated that there were eight instances of normal returns and only 10 instances of positive abnormal returns. Although this limited observation leaves little to make an argument for selecting the “better” estimation technique to apply in this or other analyses, it could generally be argued that the

estimation method yielding the fewest instances of statistically significant abnormal returns would be the less biased choice. In this research that would prove to be the logarithmic estimation method. Additionally, it should be noted that as this discrepancy occurred on the 40th trading day. If one were to extend the analysis beyond the 40-day benchmark it is reasonable to hypothesize that these discrepancies may appear more frequently as time and more information affect prices and the data becomes more widely dispersed. However, over the shorter time horizon (40 days and less), since the results are so similar, it is also reasonable to argue that the arithmetic return method may be applied for no other reason than that it is simply a more straight-forward calculation since the end result of identifying instances of abnormal returns is effectively the same. It is also worth noting that the adjusted R-square values are consistent across both estimation methods.

Logarithmic Results	Percentage of Events with Normal Returns	Percentage of Events with Statistically Significant Abnormal Positive Returns	Percentage of Events with Statistically Significant Abnormal Negative Returns
Boeing			
Day 1 or 2	9.1%	68.2%	22.7%
Day 10	40.9%	45.5%	13.6%
Day 20	40.9%	45.5%	13.6%
Day 40	31.8%	40.9%	27.3%
Lockheed Martin			
Day 1 or 2	3.8%	57.7%	38.5%
Day 10	19.2%	57.7%	23.1%
Day 20	38.5%	38.5%	23.1%
Day 40	30.8%	42.3%	26.9%
Northrop Grumman			
Day 1 or 2	0.0%	42.3%	57.7%
Day 10	26.9%	38.5%	34.6%
Day 20	19.2%	53.8%	26.9%
Day 40	30.8%	38.5%	30.8%
Raytheon			
Day 1 or 2	11.1%	55.6%	33.3%
Day 10	22.2%	61.1%	16.7%
Day 20	22.2%	50.0%	27.8%
Day 40	38.9%	33.3%	27.8%

Table 20. Summary of Logarithmic Return Results

VI. CONCLUSIONS, LIMITATIONS, AND RECOMMENDED FUTURE RESEARCH

A. CHAPTER OVERVIEW

This chapter provides a brief review of the conclusions regarding the event-study analysis, summarizes recommendations for future research, and articulates some concerns regarding the limitations of this project.

B. CONCLUSIONS

In drawing conclusions about this project, it is important to recall the original objectives: considering not only how quickly the market reacts to corporate consolidations within the defense aerospace industry, but also how accurately it reacts. The results of the focus firms, including Boeing, Lockheed Martin, Northrop Grumman and Raytheon, serve as a foundation to begin exploring these questions within the industry. The first point to be taken from this research is that there is clear evidence that the market does respond quickly to the release of such news. At 89%, Raytheon was the firm with the lowest proportion of statistically significant abnormal returns on the day of or the day following the consolidation announcement. Consolidation announcements for the remaining firms resulted in significant abnormal returns ranging from 91 percent for Boeing to 100 percent for Northrop Grumman on the day of or the day following the announcement.

The second point is with regard to how accurately this information was absorbed by the market. In this research, the term “accuracy” meant the consistency with which the market’s initial evaluation to the news at the time of the announcement was retained throughout the 40-day post-announcement period (i.e., the results for the 10th, 20th, and 40th day were the same as the initial result). If the market is confident in its initial evaluation of the news over the remaining 40 days—thus indicating an accurate initial reaction—one would expect to see a consistent return pattern over that period. If, on the other hand, the market’s perception and thus evaluation of the announcement changes

over that time horizon (i.e., the initial reaction was not accurate), then one would expect to see either a dissipation of abnormal returns or a fluctuation in such returns. Considering the relatively few instances of consistent abnormal returns across days 1, 10, 20 and 40 (between 5% and 27% of the cases), it appears that the market exhibits a propensity to reevaluate its initial reaction to consolidation announcements over the following 40 trading days. Reflecting back on Table 18, the data indicate that for all of the firms aside from Lockheed Martin, the market is generally as likely to maintain a consistent evaluation by the 40th trading day as it is to reverse its evaluation of the consolidation announcement. There may be a number of reasons for this, including the possibility that additional information regarding consolidations becomes available after the initial announcement.

In reviewing the results of this analysis, it is also important to step back for a moment and reflect on the previous work explored in the literature review. Both Weston (1983) and Lubatkin (1987) found that the positive abnormal returns persisted over time. When looking specifically at the return on the 1st day and the return on the 40th day, this research concurs with that finding in that generally the largest proportion of observations both began and ended with a positive abnormal return over the 40-day period. Northrop Grumman was the only firm to deviate from this pattern, although not by a large margin in that 23% of the cases began with a negative abnormal return and ended with a positive abnormal return while 19% of the cases began and ended with a positive abnormal return (with regard to the arithmetic calculations). Although this circumstance of a positive abnormal return for the shareholder seems to occur most frequently, the findings of this research also follow those of Grant (2007) in that the results are still relatively mixed between day 1 and day 40. Looking at the end result from the shareholder's perspective—that is the abnormal return on the 40th trading day—it is generally favorable in the sense that it is a positive abnormal return, a result that is in general agreement with the previous literature, which would suggest normal returns or positive abnormal returns to the shareholders of acquiring firms. In the cases of Boeing, Lockheed Martin and Northrop Grumman the shareholders experience a positive abnormal return between 40-42% of the time when utilizing the arithmetic return method

(38-42% of the time for the logarithmic method). Raytheon is the only firm to deviate from this pattern in that positive abnormal returns only occur in approximately one third of the cases. However, if one is to account for Lubatkin's finding that the value of a merger may be understated if there are other mergers occurring within the same timeframe then one would expect this pattern to be more pronounced if those other factors could be isolated and controlled for within the analysis.

C. LIMITATIONS AND POTENTIAL FUTURE RESEARCH

The scope of this MBA project had certain limitations that should be noted. Of particular significance is that this project reviewed only a limited number of defense contractor consolidations; more robust results relating to the broader defense contractor arena would be obtained from a broader analysis of consolidation activity involving additional firms or sectors within the industry. Furthermore, future research could capture greater detail concerning other timely factors that may have affected the stock price returns near the date of a corporate consolidation announcement, such as: the announcement of other corporate consolidations, other corporate actions, or other news which may have leaked to the market prior to the announcement as well as the proximity of the corporate action announcement date to the corporate action effective date.

Additionally, much of the event study literature in other industries is segregated by acquiring and acquired firm as this seems to have an impact with regard to the markets reaction. Due to the application of Yahoo Finance data which does not provide a source for historic stock prices for ticker symbols that are no longer traded, there was not sufficient data to perform this type of segregated analysis. As such, if possible, this distinction could reveal additional event study trends within the defense aerospace industry.

Furthermore, additional statistical analysis should be conducted to more explicitly examine those instances in which statistically significant abnormal returns persist for multiple days to better understand these occurrences. It is also important to note that the application of event studies over the 40-day post-announcement time horizon only provides a snapshot of the market's reaction and expectations for the consolidation. In reality, initial expectations and the empirical long-term results of such an event may be significantly different.

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APPENDIX A. PRIME CONTRACTORS IN DEFENSE MARKET SECTORS (1990–1998)

Sector	Reduction in Contractors	1990 Contractors	1998 Contractors
Tactical missiles	13 to 4	Boeing Ford Aerospace General Dynamics Hughes Lockheed Loral LTV Martin Marietta McDonnell Douglas Northrop Raytheon Rockwell Texas Instruments	Boeing Lockheed Martin Northrop Grumman Raytheon
Fixed-wing aircraft	8 to 3	Boeing General Dynamics Grumman Lockheed LTV-Aircraft McDonnell Douglas Northrop Rockwell	Boeing Lockheed Martin Northrop Grumman
Expendable launch vehicles	6 to 2	Boeing General Dynamics Lockheed Martin Marietta McDonnell Douglas Rockwell	Boeing Lockheed Martin
Satellites	8 to 5	Boeing General Electric Hughes Lockheed Loral Martin Marietta TRW Rockwell	Boeing Lockheed Martin Hughes Loral Space Systems TRW
Surface ships	8 to 5	Avondale Industries Bath Iron Works Bethlehem Steel Ingalls Shipbuilding NASSCO Newport News Shipbuilding Tacoma	Avondale Industries General Dynamics (Bath Iron Works) Ingalls Shipbuilding NASSCO Newport News Shipbuilding

Tampa			
Tactical wheeled vehicles	6 to 4	AM General Harsco (BMY) GM Canada Oskosh Stewart & Stevenson Teledyne Cont. Motors	AM General GM Canada Oskosh Stewart & Stevenson
Tracked combat vehicles	3 to 2	FMC General Dynamics Harsco (BMY)	General Dynamics United Defense LP
Strategic missiles	3 to 2	Boeing Lockheed Martin Marietta	Boeing Lockheed Martin
Torpedoes	3 to 2	Alliant Tech Systems Hughes Westinghouse	Northrop Grumman Raytheon
Rotary-wing aircraft	4 to 3	Bell Helicopters Boeing McDonnell Douglas Sikorsky	Bell Helicopters Boeing Sikorsky

Source: Defense Industry Consolidation and Options for Preserving Competition

APPENDIX B. CALENDAR OF CORPORATE CONSOLIDATIONS

Date	Acquiring Firm	Target Firm
11/23/1992	Martin Marietta	GE Aerospace
12/9/1992	Lockheed	Tactical Military Aircraft
1/20/1993	Raytheon	Applied Remote Technology
2/17/1993	Raytheon	Power GRP & Transportation
6/1/1993	Raytheon	Corporate Jests Business
11/17/1993	Raytheon	Ebasco Services Inc
4/4/1994	Northrop Grumman	Grumman Corp
8/30/1994	Martin Marietta	Lockheed Corp
9/9/1994	Raytheon	Xplex Inc
1/3/1995	Boeing	Precision Gear
4/3/1995	Raytheon	Raytheon E-Systems Inc
6/30/1995	Raytheon	Litwin Engineers & Construction
1/3/1996	Northrop Grumman	Defense Electronics Business
1/8/1996	Lockheed Martin	Loral Corp
4/8/1996	Raytheon	2 Chrysler Technologies Businesses
8/1/1996	Boeing	Rockwell International Corp
12/16/1996	Boeing	McDonnell Douglas Corp
1/6/1997	Raytheon	Defense Business
1/16/1997	Raytheon	Defense Business
5/5/1997	Northrop Grumman	Logicon Inc
7/3/1997	Lockheed Martin	Northrop Grumman Corp
2/26/1998	Lockheed Martin	Postal Tech
3/18/1998	Boeing	Rada Electronic Industries
7/21/1998	Raytheon	Communication System Business
8/10/1998	Northrop Grumman	Inter-National Research Ins
8/21/1998	Northrop Grumman	1,415 Acre Radar Test Site
9/20/1998	Lockheed Martin	Comsat Corp
12/14/1998	Lockheed Martin	U.S. Public Technologies, LLC
1/8/1999	Lockheed Martin	Canadian Public Technologies
2/8/1999	Boeing	Advanced Visual Software
3/11/1999	Northrop Grumman	Information Systems Division
5/19/1999	Northrop Grumman	Data Procurement Corp Inc
5/27/1999	Northrop Grumman	Ryan Aeronautical
7/2/1999	Boeing	Radiant Energy Corp
11/12/1999	Northrop Grumman	Navia Aviation AS
1/13/2000	Boeing	Hughes Satellite Systems
4/10/2000	Northrop Grumman	Explosive Ordnance Disposal
6/1/2000	Boeing	Autometric Inc
6/12/2000	Northrop Grumman	Comptek Research Inc
6/27/2000	Boeing	SVS Inc
8/2/2000	Boeing	Continental Graphics Corp
8/15/2000	Boeing	Jeppesen Sanderson Inc
9/1/2000	Boeing	AeroInfo Systems Inc
9/6/2000	Northrop Grumman	Federal Data Corp

9/18/2000	Northrop Grumman	Sterling Software U.S. Inc
10/17/2000	Boeing	Hawker De Havilland Ltd
12/21/2000	Northrop Grumman	Litton Industries Inc
4/6/2001	Northrop Grumman	Solytic SA
4/20/2001	Northrop Grumman	Electronics & Information Systems
5/9/2001	Northrop Grumman	Newport News Shipbuilding
7/27/2001	Boeing	SBS International
10/26/2001	Lockheed Martin	Oao Corp
12/18/2001	Boeing	6 Aircraft
2/22/2002	Northrop Grumman	Northrop Grumman Space & Mission
9/23/2002	Boeing	Flightsafety Boeing Training
12/6/2002	Northrop Grumman	TRW Marzocchi Automotive Pumps
12/18/2002	Northrop Grumman	Fibersense Technology Corp
12/20/2002	Raytheon	Solipsys Corp
12/20/2002	Raytheon	JPS Communications Inc
1/10/2003	Boeing	Conquest Inc
3/11/2003	Lockheed Martin	LongShot Wing Kit
5/15/2003	Lockheed Martin	ORINCON Industries
7/24/2003	Northrop Grumman	Xontech Inc
7/25/2003	Raytheon	Aerospace and Defense Services
8/1/2003	Lockheed Martin	Federal Govt IT Business
9/15/2003	Lockheed Martin	Titan Corp
10/29/2003	Lockheed Martin	Astrolink International LLC
11/5/2003	Lockheed Martin	Astrolink International LLC
5/4/2004	Boeing	Frontier Systems Inc
9/29/2004	Boeing	3700 Bay Area Boulevard
10/6/2004	Raytheon	Photon Research Associates
10/29/2004	Lockheed Martin	Sippican Inc
12/13/2004	Lockheed Martin	Stasys Ltd
1/31/2005	Northrop Grumman	Electro Optic Systems Holdings
2/18/2005	Lockheed Martin	The Sytex Group Inc
8/16/2005	Lockheed Martin	INSYS Group Ltd
8/22/2005	Raytheon	UTD Inc
9/8/2005	Lockheed Martin	Coherent Technologies Inc
9/21/2005	Northrop Grumman	Rights to Proprietary Software
12/16/2005	Lockheed Martin	Aspen Systems Corp
12/29/2005	Raytheon	Flight Options LLC
1/23/2006	Lockheed Martin	HMT Vehicles Ltd
1/24/2006	Raytheon	Houston Associates Inc
3/3/2006	Boeing	Carmen Systems AB
3/21/2006	Northrop Grumman	CEA Technologies Pty Ltd
5/1/2006	Boeing	Aviall Inc
5/4/2006	Lockheed Martin	Savi Technology Inc
7/5/2006	Raytheon	Virtual Technology Corp
8/17/2006	Lockheed Martin	Pacific Architects and Engineering
8/18/2006	Boeing	C-Map
11/8/2006	Northrop Grumman	Essex Corp
12/21/2006	Lockheed Martin	Management Systems Designer

APPENDIX C. HISTOGRAM OF HISTORIC DAILY RETURNS

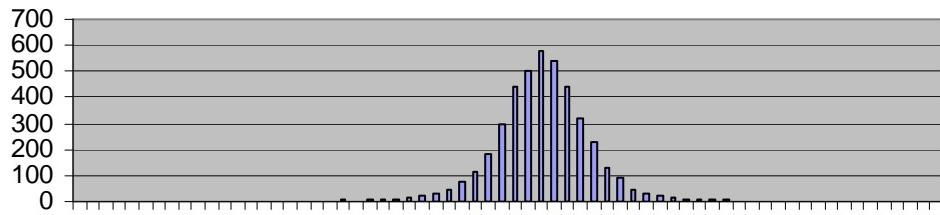


Figure 14. Boeing Arithmetic Return

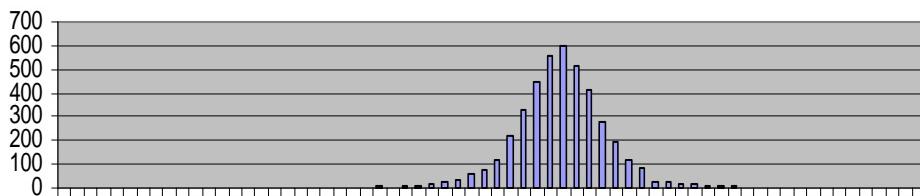


Figure 15. Boeing Logarithmic Return

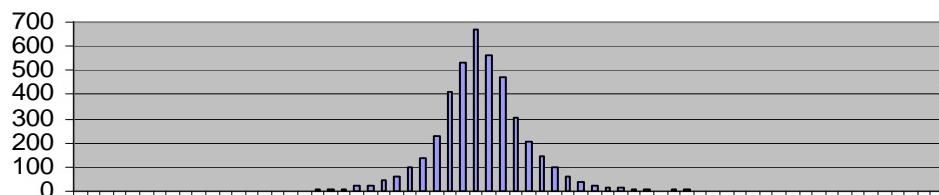


Figure 16. Lockheed Martin Arithmetic Return

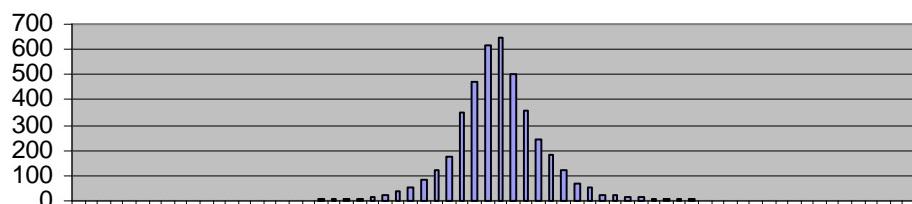
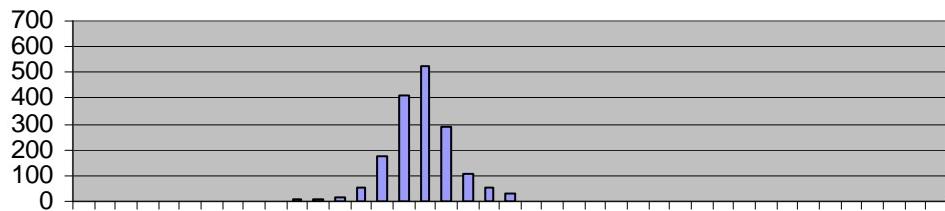


Figure 17. Lockheed Martin Logarithmic Return



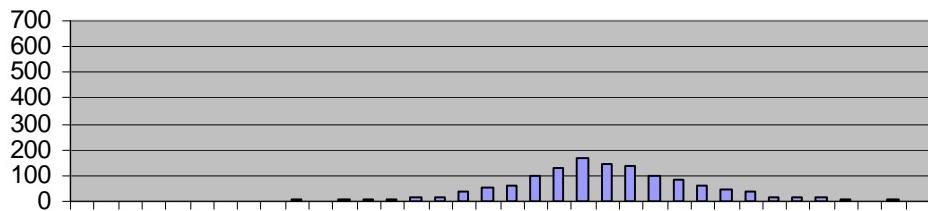


Figure 23. S&P 500 Index Logarithmic Return

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APPENDIX D. LOGISTIC REGRESSION RESULTS AND ABNORMAL RETURN ESTIMATES FOR ACQUIRING FIRMS

A. BOEING REGRESSION ESTIMATES

Event Date		Target	Acquirer	
1/3/1995		Precision Gear	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.102146717	Adjusted R Square	0.102768765
	Standard Deviation	0.103291061	Standard Deviation	0.10317488
	95% CI (+/-)	0.000568075	95% CI (+/-)	0.000567436
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0098%	*	0.0097%	*
Day 10	0.0042%		0.0040%	
Day 20	0.0115%	*	0.0113%	*
Day 40	-0.0095%	*	-0.0097%	*
Event Date		Target	Acquirer	
8/1/1996		Rockwell International Corp	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.309371643	Adjusted R Square	0.310865192
	Standard Deviation	0.160886353	Standard Deviation	0.159784099
	95% CI (+/-)	0.000884834	95% CI (+/-)	0.000878772
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0536%	*	0.0526%	*
Day 10	0.0036%		0.0033%	
Day 20	-0.0338%		-0.0341%	
Day 40	0.0040%	*	0.0037%	*
Event Date		Target	Acquirer	
12/16/1996		McDonnell Douglas Corp	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.029180719	Adjusted R Square	0.029241557
	Standard Deviation	0.067876042	Standard Deviation	0.068161434
	95% CI (+/-)	0.000777088	95% CI (+/-)	0.000780356
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0073%	*	-0.0075%	*
Day 10	-0.0126%		-0.0129%	
Day 20	-0.0009%		-0.0011%	

Note: * is significant at the 5% level

Day 40	0.0136%	*	0.0134%	*
Event Date		Target	Acquirer	
3/18/1998		Rada Electronic Industries	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.38499623	Adjusted R Square	0.390718185
	Standard Deviation	0.21325635	Standard Deviation	0.212770427
	95% CI (+/-)	0.001172856	95% CI (+/-)	0.001170184
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0095%	*	0.0091%	*
Day 10	0.0125%	*	0.0121%	*
Day 20	-0.0301%		-0.0309%	
Day 40	-0.0068%	*	-0.0073%	*
Event Date		Target	Acquirer	
2/8/1999		Advanced Visual Software	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.221291537	Adjusted R Square	0.218439579
	Standard Deviation	0.317433085	Standard Deviation	0.322829991
	95% CI (+/-)	0.001745802	95% CI (+/-)	0.001775484
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0663%	*	-0.0686%	*
Day 10	-0.0041%		-0.0053%	
Day 20	-0.0084%	*	-0.0097%	*
Day 40	0.0179%	*	0.0168%	*
Event Date		Target	Acquirer	
7/2/1999		Radiant Energy Corp	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.030852878	Adjusted R Square	0.02922715
	Standard Deviation	0.100720104	Standard Deviation	0.101460462
	95% CI (+/-)	0.001153108	95% CI (+/-)	0.001161584
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0046%	*	0.0041%	*
Day 10	-0.0067%		-0.0070%	
Day 20	-0.0013%		-0.0016%	
Day 40	-0.0142%		-0.0144%	
Event Date		Target	Acquirer	
1/13/2000		Hughes Satellite Systems	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.07330546	Adjusted R Square	0.073849472

Note: * is significant at the 5% level

	Standard Deviation	0.224378092	Standard Deviation	0.223862932
	95% CI (+/-)	0.001234023	95% CI (+/-)	0.00123119
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0155%	*	0.0150%	*
Day 10	-0.0360%		-0.0371%	
Day 20	-0.0276%	*	-0.0284%	*
Day 40	-0.0110%	*	-0.0115%	*
Event Date		Target	Acquirer	
6/1/2000		Autometric Inc	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.109036541	Adjusted R Square	0.111571087
	Standard Deviation	0.154333819	Standard Deviation	0.152242308
	95% CI (+/-)	0.001766912	95% CI (+/-)	0.001742967
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0460%	*	0.0448%	*
Day 10	0.0204%	*	0.0194%	*
Day 20	-0.0048%		-0.0059%	
Day 40	-0.0261%		-0.0277%	
Event Date		Target	Acquirer	
6/27/2000		SVS Inc	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.109036541	Adjusted R Square	0.111571087
	Standard Deviation	0.154333819	Standard Deviation	0.152242308
	95% CI (+/-)	0.001766912	95% CI (+/-)	0.001742967
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0155%	*	0.0145%	*
Day 10	0.0246%	*	0.0236%	*
Day 20	-0.0159%		-0.0172%	
Day 40	0.0195%	*	0.0185%	*
Event Date		Target	Acquirer	
8/2/2000		Continental Graphics Corp	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.109036541	Adjusted R Square	0.111571087
	Standard Deviation	0.154333819	Standard Deviation	0.152242308
	95% CI (+/-)	0.001766912	95% CI (+/-)	0.001742967
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0222%	*	0.0214%	*
Day 10	0.0040%	*	0.0032%	*
Day 20	0.0015%		0.0007%	
Day 40	0.0403%	*	0.0392%	*

Note: * is significant at the 5% level

Event Date		Target	Acquirer	
8/15/2000		Jeppesen Sanderson Inc	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.109036541	Adjusted R Square	0.111571087
	Standard Deviation	0.154333819	Standard Deviation	0.152242308
	95% CI (+/-)	0.001766912	95% CI (+/-)	0.001742967
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0039%	*	0.0031%	*
Day 10	0.0043%		0.0035%	
Day 20	0.0110%		0.0102%	
Day 40	-0.0145%		-0.0155%	
Event Date		Target	Acquirer	
9/1/2000		AeroInfo Systems Inc	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.109036541	Adjusted R Square	0.111571087
	Standard Deviation	0.154333819	Standard Deviation	0.152242308
	95% CI (+/-)	0.001766912	95% CI (+/-)	0.001742967
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0103%	*	0.0095%	*
Day 10	-0.0112%		-0.0122%	
Day 20	0.0074%	*	0.0066%	*
Day 40	0.0256%	*	0.0248%	*
Event Date		Target	Acquirer	
10/17/2000		Hawker De Havilland Ltd	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.069532009	Adjusted R Square	0.068083055
	Standard Deviation	0.166897669	Standard Deviation	0.16962399
	95% CI (+/-)	0.001910751	95% CI (+/-)	0.001941964
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0128%		-0.0140%	
Day 10	0.0412%	*	0.0403%	*
Day 20	0.0432%	*	0.0422%	*
Day 40	0.0004%		-0.0005%	
Event Date		Target	Acquirer	
7/27/2001		SBS International	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.17871229	Adjusted R Square	0.178668577
	Standard Deviation	0.223399412	Standard Deviation	0.224174849
	95% CI (+/-)	0.001228641	95% CI (+/-)	0.001232905
	Observations	130	Observations	130

Note: * is significant at the 5% level

	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0053%	*	0.0050%	*
Day 10	0.0096%	*	0.0093%	*
Day 20	0.0278%	*	0.0273%	*
Day 40	0.0308%	*	0.0302%	*
Event Date		Target	Acquirer	
12/18/2001		6 Aircraft	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.217624843	Adjusted R Square	0.216637871
	Standard Deviation	0.08870898	Standard Deviation	0.0891505
	95% CI (+/-)	0.001015597	95% CI (+/-)	0.001020652
	Observations	30	Observations	30
Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant	
Day 1 or 2	0.0241%	*	0.0237%	*
Day 10	0.0282%	*	0.0278%	*
Day 20	0.0303%	*	0.0299%	*
Day 40	-0.0227%		-0.0233%	
Event Date		Target	Acquirer	
9/23/2002		Flightsafety BA Training	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.330651636	Adjusted R Square	0.335430039
	Standard Deviation	0.226290142	Standard Deviation	0.226694142
	95% CI (+/-)	0.001244539	95% CI (+/-)	0.001246761
	Observations	130	Observations	130
Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant	
Day 1 or 2	-0.0415%	*	-0.0426%	*
Day 10	-0.0459%	*	-0.0471%	*
Day 20	0.0424%	*	0.0419%	*
Day 40	-0.0248%	*	-0.0256%	*
Event Date		Target	Acquirer	
1/10/2003		Conquest Inc	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.395459653	Adjusted R Square	0.390894643
	Standard Deviation	0.070522333	Standard Deviation	0.070809048
	95% CI (+/-)	0.000807385	95% CI (+/-)	0.000810667
	Observations	30	Observations	30
Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant	
Day 1 or 2	0.0020%	*	0.0018%	*
Day 10	-0.0355%	*	-0.0359%	*
Day 20	0.0195%	*	0.0192%	*
Day 40	-0.0174%	*	-0.0176%	*
Event Date		Target	Acquirer	
5/4/2004		Frontier Systems Inc	Boeing	
	Arithmetic Return	Logarithmic Return		

Note: * is significant at the 5% level

	Adjusted R Square	0.495640618	Adjusted R Square	0.495762076
	Standard Deviation	0.142466999	Standard Deviation	0.141275714
	95% CI (+/-)	0.000783533	95% CI (+/-)	0.000776981
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0070%	*	0.0068%	*
Day 10	0.0199%	*	0.0197%	*
Day 20	0.0110%	*	0.0108%	*
Day 40	-0.0249%		-0.0253%	
Event Date		Target	Acquirer	
9/29/2004		3700 Bay Area Boulevard	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.467032403	Adjusted R Square	0.467660523
	Standard Deviation	0.048282142	Standard Deviation	0.048041444
	95% CI (+/-)	0.000552765	95% CI (+/-)	0.000550009
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0112%	*	0.0111%	*
Day 10	-0.0211%	*	-0.0212%	*
Day 20	0.0353%	*	0.0348%	*
Day 40	0.0107%	*	0.0106%	*
Event Date		Target	Acquirer	
3/3/2006		Carmen Systems AB	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.28748153	Adjusted R Square	0.294892278
	Standard Deviation	0.12820994	Standard Deviation	0.127672833
	95% CI (+/-)	0.000705122	95% CI (+/-)	0.000702168
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0087%	*	-0.0088%	*
Day 10	0.0024%		0.0023%	
Day 20	-0.0050%		-0.0051%	
Day 40	-0.0050%		-0.0051%	
Event Date		Target	Acquirer	
5/1/2006		Aviall Inc	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.221816767	Adjusted R Square	0.223626056
	Standard Deviation	0.054094246	Standard Deviation	0.053666531
	95% CI (+/-)	0.000619305	95% CI (+/-)	0.000614409
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0111%		0.0110%	
Day 10	0.0066%	*	0.0065%	*

Note: * is significant at the 5% level

Day 20	-0.0163%	*	-0.0165%	*
Day 40	-0.0079%	*	-0.0080%	*
Event Date		Target	Acquirer	
8/18/2006		C-Map	Boeing	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.462069593	Adjusted R Square	0.455870796
	Standard Deviation	0.079122948	Standard Deviation	0.079616697
	95% CI (+/-)	0.00090585	95% CI (+/-)	0.000911503
	Observations	30	Observations	30
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
	Day 1 or 2	-0.0106%	*	-0.0108% *
	Day 10	0.0103%	*	0.0101% *
	Day 20	0.0004%	*	0.0002% *
	Day 40	0.0035%	*	0.0033% *

B. LOCKHEED MARTIN REGRESSION RESULTS

Event Date		Target	Acquirer	
11/23/1992		GE Aerospace	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.06321369	Adjusted R Square	0.061303349
	Standard Deviation	0.115773231	Standard Deviation	0.115662797
	95% CI (+/-)	0.000636724	95% CI (+/-)	0.000636116
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
	Day 1 or 2	0.0402%	*	0.0396% *
	Day 10	0.0293%		0.0287%
	Day 20	0.0026%		0.0022%
	Day 40	0.0351%	*	0.0345% *
Event Date		Target	Acquirer	
12/9/1992		Tactical Military Aircraft	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.06321369	Adjusted R Square	0.061303349
	Standard Deviation	0.115773231	Standard Deviation	0.115662797
	95% CI (+/-)	0.000636724	95% CI (+/-)	0.000636116
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
	Day 1 or 2	-0.0089%	*	-0.0093% *
	Day 10	-0.0081%		-0.0085%
	Day 20	-0.0133%		-0.0137%
	Day 40	-0.0003%		-0.0006%
Event Date		Target	Acquirer	

Note: * is significant at the 5% level

8/30/1994		LMT Corp	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.079894598	Adjusted R Square	0.081204821
	Standard Deviation	0.104600511	Standard Deviation	0.104519699
	95% CI (+/-)	0.000575276	95% CI (+/-)	0.000574832
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0157%	*	0.0154%	*
Day 10	0.0123%	*	0.0121%	*
Day 20	0.0256%	*	0.0254%	*
Day 40	0.0095%	*	0.0093%	*
Event Date		Target	Acquirer	
1/8/1996		Loral Corp	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.003469442	Adjusted R Square	0.00326564
	Standard Deviation	0.138585514	Standard Deviation	0.137390536
	95% CI (+/-)	0.000762185	95% CI (+/-)	0.000755613
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0091%	*	0.0088%	*
Day 10	0.0090%	*	0.0087%	*
Day 20	0.0113%	*	0.0110%	*
Day 40	0.0109%	*	0.0106%	*
Event Date		Target	Acquirer	
7/3/1997		NOC Corp	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.000428104	Adjusted R Square	0.000324848
	Standard Deviation	0.143921146	Standard Deviation	0.143509776
	95% CI (+/-)	0.00079153	95% CI (+/-)	0.000789268
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0194%	*	0.0190%	*
Day 10	-0.0214%	*	-0.0216%	*
Day 20	-0.0085%		-0.0087%	
Day 40	-0.0048%		-0.0050%	
Event Date		Target	Acquirer	
2/26/1998		Postal Tech	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.131625199	Adjusted R Square	0.131685392
	Standard Deviation	0.15113953	Standard Deviation	0.150653047
	95% CI (+/-)	0.000831229	95% CI (+/-)	0.000828554
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0065%	*	0.0064%	*

Note: * is significant at the 5% level

Day 10	0.0018%	*	0.0016%	*
Day 20	-0.0009%		-0.0011%	
Day 40	-0.0116%	*	-0.0118%	*
Event Date		Target	Acquirer	
12/14/1998		U.S. Public Technologies, LLC	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.189610323	Adjusted R Square	0.186770528
	Standard Deviation	0.244005134	Standard Deviation	0.243634046
	95% CI (+/-)	0.001341967	95% CI (+/-)	0.001339926
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0233%	*	0.0225%	*
Day 10	0.0157%	*	0.0150%	*
Day 20	-0.0080%	*	-0.0084%	*
Day 40	0.0314%	*	0.0304%	*
Event Date		Target	Acquirer	
1/8/1999		Canadian Public Technologies	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.189610323	Adjusted R Square	0.186770528
	Standard Deviation	0.244005134	Standard Deviation	0.243634046
	95% CI (+/-)	0.001341967	95% CI (+/-)	0.001339926
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0173%	*	-0.0178%	*
Day 10	0.0089%	*	0.0082%	*
Day 20	0.0029%	*	0.0023%	*
Day 40	-0.0066%	*	-0.0071%	*
Event Date		Target	Acquirer	
10/26/2001		Oao Corp	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.076575639	Adjusted R Square	0.069955699
	Standard Deviation	0.248772731	Standard Deviation	0.242250224
	95% CI (+/-)	0.001368187	95% CI (+/-)	0.001332315
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0061%	*	0.0047%	*
Day 10	0.0058%	*	0.0053%	*
Day 20	0.0057%	*	0.0055%	*
Day 40	0.0058%	*	0.0053%	*
Event Date		Target	Acquirer	
3/11/2003		LongShot Wing Kit	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	

Note: * is significant at the 5% level

	Adjusted R Square	0.019853578	Adjusted R Square	0.020713696
	Standard Deviation	0.268257657	Standard Deviation	0.270643689
	95% CI (+/-)	0.00147535	95% CI (+/-)	0.001488472
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0116%	*	-0.0122%	*
Day 10	0.0004%		-0.0004%	
Day 20	-0.0078%		-0.0084%	
Day 40	-0.0096%		-0.0103%	
Event Date		Target	Acquirer	
5/15/2003		ORINCON Industries	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.223064546	Adjusted R Square	0.220113816
	Standard Deviation	0.192589919	Standard Deviation	0.189785805
	95% CI (+/-)	0.001059196	95% CI (+/-)	0.001043774
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0119%	*	0.0114%	*
Day 10	0.0241%	*	0.0233%	*
Day 20	-0.0200%	*	-0.0199%	*
Day 40	0.0080%	*	0.0077%	*
Event Date		Target	Acquirer	
8/1/2003		Federal Govt IT Business	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.155139508	Adjusted R Square	0.153214996
	Standard Deviation	0.155132513	Standard Deviation	0.154882179
	95% CI (+/-)	0.00085319	95% CI (+/-)	0.000851813
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0079%	*	0.0078%	*
Day 10	0.0048%	*	0.0047%	*
Day 20	0.0109%	*	0.0107%	*
Day 40	0.0165%	*	0.0162%	*
Event Date		Target	Acquirer	
9/15/2003		Titan Corp	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.155139508	Adjusted R Square	0.153214996
	Standard Deviation	0.155132513	Standard Deviation	0.154882179
	95% CI (+/-)	0.00085319	95% CI (+/-)	0.000851813
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0226%	*	0.0221%	*
Day 10	0.0169%	*	0.0166%	*
Day 20	0.0135%	*	0.0132%	*

Note: * is significant at the 5% level

Day 40	-0.0025%	*	-0.0026%	*
Event Date		Target	Acquirer	
10/29/2003		Astrolink International LLC	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.014117112	Adjusted R Square	0.014269989
	Standard Deviation	0.13597389	Standard Deviation	0.137092856
	95% CI (+/-)	0.000747822	95% CI (+/-)	0.000753976
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0079%	*	-0.0081%	*
Day 10	-0.0033%	*	-0.0035%	*
Day 20	-0.0059%	*	-0.0061%	*
Day 40	-0.0069%		-0.0071%	
Event Date		Target	Acquirer	
11/5/2003		Astrolink International LLC	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.014117112	Adjusted R Square	0.014269989
	Standard Deviation	0.13597389	Standard Deviation	0.137092856
	95% CI (+/-)	0.000747822	95% CI (+/-)	0.000753976
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0080%	*	-0.0082%	*
Day 10	-0.0046%	*	-0.0047%	*
Day 20	-0.0058%		-0.0059%	
Day 40	-0.0030%		-0.0031%	
Event Date		Target	Acquirer	
10/29/2004		Sippican Inc	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.22665476	Adjusted R Square	0.225897402
	Standard Deviation	0.112291427	Standard Deviation	0.112127344
	95% CI (+/-)	0.000617575	95% CI (+/-)	0.000616672
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0060%	*	0.0059%	*
Day 10	0.0143%	*	0.0141%	*
Day 20	-0.0014%		-0.0015%	
Day 40	0.0118%	*	0.0117%	*
Event Date		Target	Acquirer	
12/13/2004		Stasys Ltd	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.22665476	Adjusted R Square	0.225897402
	Standard Deviation	0.112291427	Standard Deviation	0.112127344

Note: * is significant at the 5% level

	95% CI (+/-)	0.000617575	95% CI (+/-)	0.000616672
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0130%	*	0.0129%	*
Day 10	0.0109%	*	0.0108%	*
Day 20	-0.0043%	*	-0.0044%	*
Day 40	-0.0072%	*	-0.0073%	*
Event Date	Target	Acquirer		
2/18/2005	The Sytex Group Inc	Lockheed Martin		
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.320991717	Adjusted R Square	0.322462319
	Standard Deviation	0.104900422	Standard Deviation	0.104319689
	95% CI (+/-)	0.000576926	95% CI (+/-)	0.000573732
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0234%		-0.0236%	
Day 10	0.0090%	*	0.0089%	*
Day 20	-0.0053%		-0.0054%	
Day 40	0.0153%	*	0.0152%	*
Event Date	Target	Acquirer		
8/16/2005	INSYS Group Ltd	Lockheed Martin		
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.022710732	Adjusted R Square	0.023168767
	Standard Deviation	0.092758309	Standard Deviation	0.092634107
	95% CI (+/-)	0.000510147	95% CI (+/-)	0.000509464
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0063%	*	-0.0064%	*
Day 10	-0.0032%	*	-0.0033%	*
Day 20	-0.0032%	*	-0.0033%	*
Day 40	-0.0043%	*	-0.0043%	*
Event Date	Target	Acquirer		
9/8/2005	Coherent Technologies Inc	Lockheed Martin		
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.022710732	Adjusted R Square	0.023168767
	Standard Deviation	0.092758309	Standard Deviation	0.092634107
	95% CI (+/-)	0.000510147	95% CI (+/-)	0.000509464
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0034%	*	-0.0035%	*
Day 10	-0.0007%	*	-0.0008%	*
Day 20	-0.0035%	*	-0.0036%	*
Day 40	-0.0005%	*	-0.0005%	*

Note: * is significant at the 5% level

Event Date		Target	Acquirer	
12/16/2005		Aspen Systems Corp	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.097023076	Adjusted R Square	0.09521686
	Standard Deviation	0.10568665	Standard Deviation	0.10553895
	95% CI (+/-)	0.00058125	95% CI (+/-)	0.000580438
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0042%	*	-0.0042%	*
Day 10	0.0197%	*	0.0193%	*
Day 20	-0.0022%		-0.0023%	
Day 40	0.0058%	*	0.0057%	*
Event Date		Target	Acquirer	
1/23/2006		HMT Vehicles Ltd	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.097023076	Adjusted R Square	0.09521686
	Standard Deviation	0.10568665	Standard Deviation	0.10553895
	95% CI (+/-)	0.00058125	95% CI (+/-)	0.000580438
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0045%	*	0.0045%	*
Day 10	0.0028%		0.0028%	
Day 20	-0.0015%		-0.0015%	
Day 40	-0.0044%		-0.0044%	
Event Date		Target	Acquirer	
5/4/2006		Savi Technology Inc	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.26857316	Adjusted R Square	0.267611779
	Standard Deviation	0.085585995	Standard Deviation	0.08554041
	95% CI (+/-)	0.000470701	95% CI (+/-)	0.000470451
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0113%	*	0.0112%	*
Day 10	-0.0082%	*	-0.0082%	*
Day 20	0.0017%	*	0.0017%	*
Day 40	-0.0029%	*	-0.0029%	*
Event Date		Target	Acquirer	
6/12/2006		ISX Corp	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.26857316	Adjusted R Square	0.267611779
	Standard Deviation	0.085585995	Standard Deviation	0.08554041
	95% CI (+/-)	0.000470701	95% CI (+/-)	0.000470451
	Observations	130	Observations	130

Note: * is significant at the 5% level

	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0148%	*	-0.0149%	*
Day 10	0.0053%	*	0.0053%	*
Day 20	0.0043%	*	0.0043%	*
Day 40	-0.0046%		-0.0046%	

Event Date		Target	Acquirer	
8/17/2006		Pacific Architects and Engineering	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.144866568	Adjusted R Square	0.144825268
	Standard Deviation	0.133397009	Standard Deviation	0.13333705
	95% CI (+/-)	0.00073365	95% CI (+/-)	0.00073332
	Observations	130	Observations	130
Expected Daily Return (%)		Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0082%	*	0.0081%	*
Day 10	0.0044%	*	0.0044%	*
Day 20	0.0073%	*	0.0072%	*
Day 40	0.0069%	*	0.0068%	*
Event Date		Target	Acquirer	
12/21/2006		Management Systems Designer	Lockheed Martin	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.451121088	Adjusted R Square	0.452194878
	Standard Deviation	0.0845141	Standard Deviation	0.084169669
	95% CI (+/-)	0.000464806	95% CI (+/-)	0.000462912
	Observations	130	Observations	130
Expected Daily Return (%)		Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0084%	*	-0.0084%	*
Day 10	-0.0005%		-0.0006%	
Day 20	0.0142%	*	0.0141%	*
Day 40	-0.0011%		-0.0011%	

C. NORTHROP GRUMMAN REGRESSION RESULTS

Event Date		Target	Acquirer	
4/4/1994		Grumman Corp	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.178367	Adjusted R Square	0.178742
	Standard Deviation	0.179819	Standard Deviation	0.179519
	95% CI (+/-)	0.000989	95% CI (+/-)	0.000987
	Observations	130	Observations	130
Expected Daily Return (%)		Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.1170%	*	0.1154%	*

Note: * is significant at the 5% level

Day 10	-0.0275%	*	-0.0288%	*	
Day 20	0.0132%	*	0.0122%	*	
Day 40	0.0251%	*	0.0242%	*	
Event Date		Target	Acquirer		
1/3/1996		Defense Electronics Business	Northrop Grumman		
	Arithmetic Return		Logarithmic Return		
	Adjusted R Square	0.156754	Adjusted R Square	0.158341	
	Standard Deviation	0.108145	Standard Deviation	0.107741	
	95% CI (+/-)	0.000595	95% CI (+/-)	0.000593	
	Observations	130	Observations	130	
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant	
	Day 1 or 2	-0.0122%	*	-0.0125%	*
	Day 10	-0.0049%	*	-0.0051%	*
	Day 20	0.0337%	*	0.0334%	*
	Day 40	-0.0149%	*	-0.0152%	*
Event Date		Target	Acquirer		
5/5/1997		Logicon Inc	Northrop Grumman		
	Arithmetic Return		Logarithmic Return		
	Adjusted R Square	0.233533	Adjusted R Square	0.236311	
	Standard Deviation	0.114626	Standard Deviation	0.114548	
	95% CI (+/-)	0.00063	95% CI (+/-)	0.00063	
	Observations	130	Observations	130	
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant	
	Day 1 or 2	0.0337%	*	0.0332%	*
	Day 10	0.0062%	*	0.0061%	*
	Day 20	-0.0023%	*	-0.0024%	*
	Day 40	0.0101%	*	0.0099%	*
Event Date		Target	Acquirer		
8/10/1998		Inter-National Research Ins	Northrop Grumman		
	Arithmetic Return		Logarithmic Return		
	Adjusted R Square	0.066823	Adjusted R Square	0.068918	
	Standard Deviation	0.230602	Standard Deviation	0.238966	
	95% CI (+/-)	0.001268	95% CI (+/-)	0.001314	
	Observations	130	Observations	130	
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant	
	Day 1 or 2	-0.0291%	*	-0.0303%	*
	Day 10	0.0022%	*	0.0016%	*
	Day 20	0.0739%	*	0.0723%	*
	Day 40	-0.0145%	*	-0.0153%	*
Event Date		Target	Acquirer		
8/21/1998		1,415 Acre Radar Test Site	Northrop Grumman		
	Arithmetic Return		Logarithmic Return		
	Adjusted R Square	0.066823	Adjusted R Square	0.068918	

Note: * is significant at the 5% level

	Standard Deviation	0.230602	Standard Deviation	0.238966
	95% CI (+/-)	0.001268	95% CI (+/-)	0.001314
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0259%	*	-0.0270%	*
Day 10	-0.0242%	*	-0.0253%	*
Day 20	-0.0023%	*	-0.0030%	*
Day 40	0.0012%		0.0005%	
Event Date		Target	Acquirer	
3/11/1999		Information Systems Division	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.000298	Adjusted R Square	0.000514
	Standard Deviation	0.252359	Standard Deviation	0.250741
	95% CI (+/-)	0.001388	95% CI (+/-)	0.001379
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0057%	*	-0.0066%	*
Day 10	0.0105%	*	0.0095%	*
Day 20	-0.0010%	*	-0.0019%	*
Day 40	0.0045%	*	0.0035%	
Event Date		Target	Acquirer	
5/19/1999		Data Procurement Corp Inc	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.053299	Adjusted R Square	0.053518
	Standard Deviation	0.236374	Standard Deviation	0.235376
	95% CI (+/-)	0.0013	95% CI (+/-)	0.001295
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0044%	*	-0.0051%	*
Day 10	-0.0034%	*	-0.0041%	*
Day 20	-0.0042%	*	-0.0048%	*
Day 40	-0.0040%	*	-0.0047%	*
Event Date		Target	Acquirer	
5/27/1999		Ryan Aeronautical	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.053299	Adjusted R Square	0.053518
	Standard Deviation	0.236374	Standard Deviation	0.235376
	95% CI (+/-)	0.0013	95% CI (+/-)	0.001295
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0060%	*	-0.0065%	*
Day 10	-0.0008%	*	-0.0016%	*

Note: * is significant at the 5% level

Day 20	-0.0023%	*	-0.0031%	*
Day 40	-0.0009%	*	-0.0017%	*
Event Date		Target	Acquirer	
11/12/1999		Navia Aviation AS	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.15342	Adjusted R Square	0.153817
	Standard Deviation	0.261111	Standard Deviation	0.263141
	95% CI (+/-)	0.001436	95% CI (+/-)	0.001447
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
	Day 1 or 2	-0.0325%	*	-0.0337% *
	Day 10	-0.0547%		-0.0561%
	Day 20	-0.0329%	*	-0.0341% *
	Day 40	-0.0852%		-0.0869%
Event Date		Target	Acquirer	
4/10/2000		Explosive Ordnance Disposal	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.023841	Adjusted R Square	0.023813
	Standard Deviation	0.32177	Standard Deviation	0.316566
	95% CI (+/-)	0.00177	95% CI (+/-)	0.001741
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
	Day 1 or 2	-0.0093%	*	-0.0107% *
	Day 10	0.0908%		0.0878%
	Day 20	-0.0107%		-0.0121%
	Day 40	-0.0062%		-0.0076%
Event Date		Target	Acquirer	
6/12/2000		Comptek Research Inc	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.097724	Adjusted R Square	0.100161
	Standard Deviation	0.300457	Standard Deviation	0.296413
	95% CI (+/-)	0.001652	95% CI (+/-)	0.00163
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
	Day 1 or 2	0.0598%	*	0.0580% *
	Day 10	0.0509%	*	0.0494% *
	Day 20	0.0427%	*	0.0415% *
	Day 40	0.0411%	*	0.0399% *
Event Date		Target	Acquirer	
9/6/2000		Federal Data Corp	Northrop Grumman	
		Arithmetic Return		Logarithmic Return

Note: * is significant at the 5% level

	Adjusted R Square	0.069234	Adjusted R Square	0.070245
	Standard Deviation	0.233097	Standard Deviation	0.231091
	95% CI (+/-)	0.001282	95% CI (+/-)	0.001271
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0310%	*	0.0302%	*
Day 10	-0.0033%		-0.0038%	
Day 20	0.0273%	*	0.0266%	*
Day 40	-0.0029%		-0.0034%	
Event Date		Target	Acquirer	
9/18/2000		Sterling Software U.S. Inc	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.069234	Adjusted R Square	0.070245
	Standard Deviation	0.233097	Standard Deviation	0.231091
	95% CI (+/-)	0.001282	95% CI (+/-)	0.001271
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0405%	*	0.0396%	*
Day 10	0.0118%		0.0112%	
Day 20	0.0132%	*	0.0126%	*
Day 40	-0.0163%	*	-0.0168%	*
Event Date		Target	Acquirer	
12/21/2000		Litton Industries Inc	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.238263	Adjusted R Square	0.235775
	Standard Deviation	0.291898	Standard Deviation	0.290642
	95% CI (+/-)	0.001605	95% CI (+/-)	0.001598
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0596%	*	0.0570%	*
Day 10	-0.0039%	*	-0.0047%	*
Day 20	0.0322%	*	0.0306%	*
Day 40	-0.0439%		-0.0445%	
Event Date		Target	Acquirer	
4/6/2001		Solythic SA	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.207159	Adjusted R Square	0.203623
	Standard Deviation	0.205921	Standard Deviation	0.205216
	95% CI (+/-)	0.001133	95% CI (+/-)	0.001129
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0103%	*	0.0098%	*
Day 10	-0.0034%	*	-0.0037%	*

Note: * is significant at the 5% level

Day 20	0.0040%	*	0.0037%	*
Day 40	0.0131%	*	0.0126%	*
Event Date		Target	Acquirer	
4/20/2001		Electronics & Information Systems	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.207159	Adjusted R Square	0.203623
	Standard Deviation	0.205921	Standard Deviation	0.205216
	95% CI (+/-)	0.001133	95% CI (+/-)	0.001129
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0033%	*	-0.0036%	*
Day 10	0.0137%	*	0.0132%	*
Day 20	0.0069%	*	0.0065%	*
Day 40	0.0025%	*	0.0022%	*
Event Date		Target	Acquirer	
5/9/2001		Newport News Shipbuilding	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.207159	Adjusted R Square	0.203623
	Standard Deviation	0.205921	Standard Deviation	0.205216
	95% CI (+/-)	0.001133	95% CI (+/-)	0.001129
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0054%	*	0.0050%	*
Day 10	-0.0037%	*	-0.0041%	*
Day 20	0.0088%	*	0.0084%	*
Day 40	-0.0085%	*	-0.0089%	*
Event Date		Target	Acquirer	
2/22/2002		NOC Space & Mission	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.079931	Adjusted R Square	0.082667
	Standard Deviation	0.255204	Standard Deviation	0.248335
	95% CI (+/-)	0.001404	95% CI (+/-)	0.001366
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0052%	*	-0.0048%	*
Day 10	0.0018%	*	0.0016%	*
Day 20	0.0076%	*	0.0070%	*
Day 40	0.0141%	*	0.0130%	*
Event Date		Target	Acquirer	
12/6/2002		TRW Marzocchi Automotive Pumps	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.007554	Adjusted R Square	0.006895

Note: * is significant at the 5% level

	Standard Deviation	0.279959	Standard Deviation	0.285521
	95% CI (+/-)	0.00154	95% CI (+/-)	0.00157
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0296%	*	-0.0304%	*
Day 10	0.0118%	*	0.0110%	*
Day 20	-0.0112%		-0.0119%	
Day 40	-0.0099%	*	-0.0106%	*
Event Date		Target	Acquirer	
12/18/2002		Fibersense Technology Corp	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.007554	Adjusted R Square	0.006895
	Standard Deviation	0.279959	Standard Deviation	0.285521
	95% CI (+/-)	0.00154	95% CI (+/-)	0.00157
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0196%	*	-0.0203%	*
Day 10	-0.0043%		-0.0049%	
Day 20	-0.0207%		-0.0214%	
Day 40	0.0200%	*	0.0190%	*
Event Date		Target	Acquirer	
7/24/2003		Xontech Inc	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.237745	Adjusted R Square	0.238316
	Standard Deviation	0.167495	Standard Deviation	0.167917
	95% CI (+/-)	0.000921	95% CI (+/-)	0.000924
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0162%	*	0.0158%	*
Day 10	0.0049%		0.0046%	
Day 20	0.0000%		-0.0002%	
Day 40	-0.0068%		-0.0070%	
Event Date		Target	Acquirer	
1/31/2005		Electro Optic Systems Holdings	Northrop Grumman	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.206905	Adjusted R Square	0.208698
	Standard Deviation	0.107057	Standard Deviation	0.107104
	95% CI (+/-)	0.000589	95% CI (+/-)	0.000589
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0110%	*	0.0109%	*
Day 10	0.0001%		0.0000%	
Day 20	0.0071%	*	0.0070%	*

Note: * is significant at the 5% level

Day 40	0.0185%	*	0.0183%	*	
Event Date		Target	Acquirer		
2/18/2005		Integic Corp	Northrop Grumman		
		Arithmetic Return		Logarithmic Return	
		Adjusted R Square	0.206905	Adjusted R Square	0.208698
		Standard Deviation	0.107057	Standard Deviation	0.107104
		95% CI (+/-)	0.000589	95% CI (+/-)	0.000589
		Observations	130	Observations	130
		Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0207%	*	-0.0209%	*	
Day 10	0.0027%	*	0.0026%	*	
Day 20	-0.0076%	*	-0.0077%	*	
Day 40	0.0073%	*	0.0072%	*	
Event Date		Target	Acquirer		
9/21/2005		Rights to Proprietary Software	Northrop Grumman		
		Arithmetic Return		Logarithmic Return	
		Adjusted R Square	0.137106	Adjusted R Square	0.137883
		Standard Deviation	0.07979	Standard Deviation	0.07968
		95% CI (+/-)	0.000439	95% CI (+/-)	0.000438
		Observations	130	Observations	130
		Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0092%	*	-0.0092%	*	
Day 10	-0.0155%	*	-0.0157%	*	
Day 20	0.0174%	*	0.0172%	*	
Day 40	0.0029%	*	0.0028%	*	
Event Date		Target	Acquirer		
3/21/2006		CEA Technologies Pty Ltd	Northrop Grumman		
		Arithmetic Return		Logarithmic Return	
		Adjusted R Square	0.25697	Adjusted R Square	0.258396
		Standard Deviation	0.099976	Standard Deviation	0.099796
		95% CI (+/-)	0.00055	95% CI (+/-)	0.000549
		Observations	130	Observations	130
		Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0094%	*	0.0094%	*	
Day 10	0.0097%	*	0.0096%	*	
Day 20	0.0058%	*	0.0057%	*	
Day 40	-0.0115%	*	-0.0116%	*	
Event Date		Target	Acquirer		
11/8/2006		Essex Corp	Northrop Grumman		
		Arithmetic Return		Logarithmic Return	
		Adjusted R Square	0.000475	Adjusted R Square	0.000425
		Standard Deviation	0.088725	Standard Deviation	0.088681

Note: * is significant at the 5% level

	95% CI (+/-)	0.000488	95% CI (+/-)	0.000488
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0054%	*	-0.0054%	*
Day 10	0.0018%	*	0.0018%	*
Day 20	-0.0041%		-0.0041%	
Day 40	-0.0008%		-0.0009%	

D. RAYTHEON REGRESSION RESULTS

Event Date		Target	Acquirer	
1/20/1993		Applied Remote Technology	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.1085	Adjusted R Square	0.108802
	Standard Deviation	0.1485	Standard Deviation	0.148275
	95% CI (+/-)	0.0008	95% CI (+/-)	0.000815
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0182%	*	0.0178%	*
Day 10	0.0347%	*	0.0342%	*
Day 20	-0.0057%	*	-0.0061%	*
Day 40	0.0273%	*	0.0268%	*
Event Date		Target	Acquirer	
2/17/1993		Power GRP & Transportation	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.1085	Adjusted R Square	0.108802
	Standard Deviation	0.1485	Standard Deviation	0.148275
	95% CI (+/-)	0.0008	95% CI (+/-)	0.000815
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0056%	*	-0.0060%	*
Day 10	0.0124%	*	0.0121%	*
Day 20	-0.0158%		-0.0162%	
Day 40	0.0020%		0.0017%	
Event Date		Target	Acquirer	
6/1/1993		Corporate Jests Business	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.2131	Adjusted R Square	0.211766
	Standard Deviation	0.114	Standard Deviation	0.114014
	95% CI (+/-)	0.0006	95% CI (+/-)	0.000627
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant

Note: * is significant at the 5% level

Day 1 or 2	0.0161%	*	0.0158%	*
Day 10	-0.0219%		-0.0221%	
Day 20	-0.0198%		-0.0199%	
Day 40	-0.0190%		-0.0192%	
Event Date		Target	Acquirer	
11/17/1993		Ebasco Services Inc	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.0816	Adjusted R Square	0.082027
	Standard Deviation	0.1027	Standard Deviation	0.102608
	95% CI (+/-)	0.0006	95% CI (+/-)	0.000564
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0152%	*	-0.0153%	*
Day 10	-0.0016%		-0.0018%	
Day 20	-0.0004%		-0.0005%	
Day 40	0.0034%		0.0033%	
Event Date		Target	Acquirer	
9/9/1994		Xplex Inc	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.3288	Adjusted R Square	0.32787
	Standard Deviation	0.0998	Standard Deviation	0.099483
	95% CI (+/-)	0.0005	95% CI (+/-)	0.000547
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0042%	*	-0.0043%	*
Day 10	-0.0030%	*	-0.0032%	*
Day 20	0.0114%	*	0.0113%	*
Day 40	-0.0160%	*	-0.0162%	*
Event Date		Target	Acquirer	
4/3/1995		RTN E-Systems Inc	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.1086	Adjusted R Square	0.107807
	Standard Deviation	0.0869	Standard Deviation	0.086971
	95% CI (+/-)	0.0005	95% CI (+/-)	0.000478
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0165%	*	0.0164%	*
Day 10	0.0024%	*	0.0023%	*
Day 20	0.0070%	*	0.0069%	*
Day 40	0.0370%	*	0.0366%	*
Event Date		Target	Acquirer	
6/30/1995		Litwin Engineers & Construction	Raytheon	
		Arithmetic Return	Logarithmic Return	

Note: * is significant at the 5% level

	Adjusted R Square	0.2012	Adjusted R Square	0.201916
	Standard Deviation	0.0616	Standard Deviation	0.061355
	95% CI (+/-)	0.0003	95% CI (+/-)	0.000337
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0062%	*	0.0062%	*
Day 10	0.0070%	*	0.0070%	*
Day 20	-0.0003%		-0.0003%	
Day 40	-0.0007%		-0.0007%	
Event Date		Target	Acquirer	
4/8/1996		2 Chrysler Technologies Businesses	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.1168	Adjusted R Square	0.121202
	Standard Deviation	0.1241	Standard Deviation	0.123502
	95% CI (+/-)	0.0007	95% CI (+/-)	0.000679
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0223%	*	-0.0226%	*
Day 10	0.0086%	*	0.0084%	*
Day 20	0.0007%	*	0.0006%	*
Day 40	0.0127%	*	0.0125%	*
Event Date		Target	Acquirer	
1/6/1997		Defense Business	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.2274	Adjusted R Square	0.228883
	Standard Deviation	0.1913	Standard Deviation	0.192539
	95% CI (+/-)	0.0011	95% CI (+/-)	0.001059
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0140%	*	0.0135%	*
Day 10	-0.0007%	*	-0.0010%	*
Day 20	-0.0006%	*	-0.0009%	*
Day 40	-0.0140%	*	-0.0143%	*
Event Date		Target	Acquirer	
1/16/1997		Defense Business	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.2274	Adjusted R Square	0.228883
	Standard Deviation	0.1913	Standard Deviation	0.192539
	95% CI (+/-)	0.0011	95% CI (+/-)	0.001059
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0168%	*	0.0163%	*
Day 10	0.0323%	*	0.0315%	*

Note: * is significant at the 5% level

Day 20	0.0235%	*	0.0229%	*
Day 40	0.0082%	*	0.0078%	*
Event Date		Target	Acquirer	
7/21/1998		Communication System Business	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.0368	Adjusted R Square	0.038362
	Standard Deviation	0.2043	Standard Deviation	0.202569
	95% CI (+/-)	0.0011	95% CI (+/-)	0.001114
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0067%	*	-0.0073%	*
Day 10	-0.0225%	*	-0.0237%	*
Day 20	0.0184%	*	0.0182%	*
Day 40	0.0117%	*	0.0114%	*
Event Date		Target	Acquirer	
12/20/2002		Solipsys Corp	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.1331	Adjusted R Square	0.130948
	Standard Deviation	0.2852	Standard Deviation	0.289289
	95% CI (+/-)	0.0016	95% CI (+/-)	0.001591
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0330%	*	0.0316%	*
Day 10	-0.0279%		-0.0290%	
Day 20	-0.0399%	*	-0.0412%	*
Day 40	-0.0371%	*	-0.0383%	*
Event Date		Target	Acquirer	
7/25/2003		Aerospace and Defense Services	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.1716	Adjusted R Square	0.171373
	Standard Deviation	0.1795	Standard Deviation	0.179255
	95% CI (+/-)	0.001	95% CI (+/-)	0.000986
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0376%	*	0.0368%	*
Day 10	0.0088%	*	0.0084%	*
Day 20	-0.0198%	*	-0.0201%	*
Day 40	-0.0257%	*	-0.0261%	*
Event Date		Target	Acquirer	
10/6/2004		Photon Research Associates	Raytheon	
	Arithmetic Return		Logarithmic Return	

Note: * is significant at the 5% level

	Adjusted R Square	0.0692	Adjusted R Square	0.070972
	Standard Deviation	0.1064	Standard Deviation	0.106061
	95% CI (+/-)	0.0006	95% CI (+/-)	0.000583
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0172%	*	0.0171%	*
Day 10	0.0054%	*	0.0053%	*
Day 20	0.0257%	*	0.0255%	*
Day 40	0.0030%		0.0029%	
Event Date	Target	Acquirer		
8/22/2005	UTD Inc	Raytheon		
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.21	Adjusted R Square	0.210745
	Standard Deviation	0.0741	Standard Deviation	0.074019
	95% CI (+/-)	0.0004	95% CI (+/-)	0.000407
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0056%		-0.0057%	
Day 10	0.0246%	*	0.0244%	*
Day 20	-0.0140%	*	-0.0142%	*
Day 40	-0.0182%	*	-0.0183%	*
Event Date	Target	Acquirer		
12/29/2005	Flight Options LLC	Raytheon		
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.2547	Adjusted R Square	0.253723
	Standard Deviation	0.0787	Standard Deviation	0.078515
	95% CI (+/-)	0.0004	95% CI (+/-)	0.000432
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0059%		-0.0059%	
Day 10	0.0071%	*	0.0070%	*
Day 20	0.0070%	*	0.0069%	*
Day 40	-0.0177%		-0.0177%	
Event Date	Target	Acquirer		
1/24/2006	Houston Associates Inc	Raytheon		
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.2547	Adjusted R Square	0.253723
	Standard Deviation	0.0787	Standard Deviation	0.078515
	95% CI (+/-)	0.0004	95% CI (+/-)	0.000432
	Observations	130	Observations	130
	Expected Daily Return (%)	Significant	Expected Daily Return (%)	Significant
Day 1 or 2	0.0096%	*	0.0095%	*
Day 10	-0.0126%		-0.0127%	
Day 20	0.0204%	*	0.0202%	*

Note: * is significant at the 5% level

Day 40	0.0172%	*	0.0171%	*
Event Date		Target	Acquirer	
7/5/2006		Virtual Technology Corp	Raytheon	
	Arithmetic Return		Logarithmic Return	
	Adjusted R Square	0.336	Adjusted R Square	0.332601
	Standard Deviation	0.1116	Standard Deviation	0.111854
	95% CI (+/-)	0.0006	95% CI (+/-)	0.000615
	Observations	130	Observations	130
Expected Daily Return (%)		Significant	Expected Daily Return (%)	Significant
Day 1 or 2	-0.0154%	*	-0.0155%	*
Day 10	0.0279%	*	0.0274%	*
Day 20	0.0053%	*	0.0052%	*
Day 40	-0.0019%		-0.0019%	

Note: * is significant at the 5% level

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